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THE
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OF THE
F R E N C H
ENCYCLOPÆDIA,

OR
Universal Dictionary
OF
ARTS, SCIENCES,
TRADES and MANUFACTURES.

BEING
An Account of the ORIGIN, DESIGN,
CONDUCT, and EXECUTION
of that WORK.

TRANSLATED
*From the PREFACE of the French EDITORS,
Mess. DIDEROT and ALEMBERT.*

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THE
FRENCH
ENCYCLOPEDIA
OR
Universal Dictionary



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P R E F A C E:

BY THE

E D I T O R S,

Mess. Diderot and Alembert.

THE *Encyclopædia*, to be now laid before the Public, is not the Work of a single Hand or two; but, as the Title imports, of a learned Body: all the Members whereof, except ourselves, either have, or deserve, an establish'd Character as Authors. We presume not to anticipate a Judgment, which only belongs to the proper Judges; but think it incumbent upon us to remove an Objection, that might otherwise prejudice this great Undertaking. We, therefore, declare, that far from the Rashness of charging ourselves with a Load so disproportion'd to our Strength, our Part, as Editors, principally consists in arranging the Articles chiefly communicated to us, by others, entire.

This Declaration we expressly made in the Body of our Proposal*; but perhaps should rather have made it at the Beginning; which

* Publish'd Nov. 1750.

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might

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might then have prevented a Question often ask'd us by Gentlemen, and some Men of Letters, viz. "How is it possible that two Persons can be qualify'd to treat of all the Arts; and all the Sciences?" These Gentlemen had doubtless glanced upon our Proposal; because they were pleas'd to commend it. Our only way, therefore, to prevent the like Question for the future, was to answer it here, in the Entrance of the Work, for the sake of those who may chuse to advance no further; but for the sake of others, we shall give a circumstantial Account of the Manner, wherein the *Encyclopædia* is executed; together with a List of our Associates. But a Detail so important, both as to its Matter and Manner, may justly require a few preparatory philosophical Considerations.

Its Views. The Work, of which we now present the first Volume, has two principal Views, that of an *Encyclopædia*, and that of a *Philosophical Dictionary of Arts, Sciences, and Trades*. As an *Encyclopædia*, it should exhibit, as much as possible, the Order, Succession, and Connection of all the Parts of human Knowledge: as a *Philosophical Dictionary*, it should contain the general Principles, or Fundamentals, of every Science, and every Art, whether liberal or mechanical; along with the most essential Descriptions that constitute the Body or Substance of each respectively. These two Views, of a Systematical *Encyclopædia*, and of a *Philosophical Dictionary*, will form the Plan and Division

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Division of our Preface; wherein we shall lay down these Views distinctly; and describe the Means employ'd to execute this double Design.

It is obvious upon Reflection, that the Parts of Knowledge have a certain Connection with one another, or, that the Arts and Sciences mutually aid each other; and are consequently all link'd together. But, if it be difficult to reduce any single Art, or Science, to a few Rules, or general Principles; it is not less difficult to reduce the infinitely various Branches of human Knowledge into a single System. In order to see how far this may be effected, let us first enquire into the Origin, Generation, or Production of human Knowledge; its Causes, Signs, and the Formation of our Ideas. Such an Enquiry, besides its Use in affording a philosophical List of the Arts and Sciences, cannot be misplac'd at the Head of an *Encyclopædia* like this.

All human Knowledge may be divided into *direct* and *reflex*. The *direct* is what we receive immediately, by the Senses, without any Exertion of the Will; and comes uncalled and unobstructed to the Mind. The *reflex* is what the Mind acquires by operating upon the *direct*, in the way of uniting, separating, arranging or combining.

As all our *direct* Knowledge comes in by the Senses, all our Ideas are consequently owing to our Sensations. This was a Principle with the earliest Philosophers; and long held as an Axiom among the Schoolmen; who did it

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that honour because of its Antiquity; and would as warmly have defended *substantial Forms* and *occult Qualities*. Upon the revival of Philosophy this Truth was overlook'd, as it stood among a Number of absurd Opinions, and proscribed, in the Lump, along with them; nothing being more dangerous to Truth, or preventive of its being seen, than its keeping Company with Error. The seducing Doctrine of *innate Ideas*, recommended perhaps the stronger by its Novelty, was adopted, and long prevail'd over this Axiom of the Schoolmen, and has still its Defenders; so difficult is it for Truth to regain its Seat, when once de-thron'd by Prejudice or Sophistry. At present, however, it is almost generally acknowledg'd that the Ancients were here in the Right: nor is this the only Point, wherein the Moderns begin to do them justice.

Sensations, There is nothing more certain than the Existence of our Sensations; and to prove that they are the Foundation of all our Knowledge, we need only shew that they possibly may be so: for in sound Philosophy, Deductions, founded on Facts and acknowledg'd Truths, are preferable to what rests only upon Hypotheses, though ever so ingenious. Why then should we imagine that Man has pure intellectual Ideas born with him, when he need only reflect upon his own Sensations in order to form them? The following Particulars will shew, in fact, that our Intellectual Ideas have no other Origin than Reflection.

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The first thing taught us by our Sensations, is our own Existence, which cannot be distinguish'd from them; and consequently our primary Reflections revert back upon ourselves, or that thinking Principle which constitutes our Nature, and no way differs from ourselves. *Prove our Existence,*

A second thing taught us by our Sensations, is, the Existence of external Objects, and among the rest, that of our own Bodies; which are, in a certain Sense, external to us, even before we distinguish the separate Nature of the thinking Principle within us. *And an external World.*

The Effect which these innumerable external Objects have upon us, is so strong, constant, and attractive, that, after our Ideas of Reflection have call'd us into ourselves; those of Sensation, which every way beset and surround us, presently force us outwards; and detain us from that pensive Solitude, in which we should otherwise remain.

The Multiplicity of these Sensations, the concurring Agreement of their Evidence, the Degrees we observe in them, the involuntary Affections they excite in us, compar'd with the voluntary Controul we have over our Ideas of Reflection, which operate only upon our Sensations; all this, we find, produces in us an irresistible Impulse to ascertain the real Existence of external Objects; and to regard them as the Cause of our Sensations. Many Philosophers have held this Impulse to be the Effect of a Supreme Being, and the most

convincing Argument of the real Existence of an external World.

But as there is no relation, that we know of, betwixt any single Sensation, and the Object thus suppos'd to occasion it, we cannot reason from the one to the other: and nothing but a kind of Instinct, more certain than reasoning itself, could oblige us to draw so remote a Conclusion. But this Instinct is so strong in us, that supposing it to subsist for a Moment, whilst all external Objects were annihilated; the Reproduction of those Objects could not add to its Strength. We therefore conclude that our Sensations actually have the external Cause suppos'd; since the Effect of that Cause could no way differ from what we find in Fact. To judge otherwise is acting like *Montaigne's* Philosophers; who being ask'd to assign the Principle of Man's Actions, reply'd, they doubted whether Man existed. For fear, therefore, of obscuring a Truth acknowledg'd even by the Sceptics, when not heated in Dispute, we leave the capable Metaphysicians to discover the transcendental Cause in this Case; and, if possible, to assign the Progress of the Soul in her first Sallies; whilst drawn out, and, at the same time, detain'd within, by a Croud of Perceptions; whilst on one side, sollicit to external Objects, and on the other, pinn'd down to the Body, she is thus left, as it were, but a narrow Sphere to act in.

*The Care
requir'd of
our Bodies.*

Of all external Objects, we are most affected by our own Bodies; which belong more immediately to us. No sooner are we sensible that

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that our Body exists, but we find the Care requir'd of us to guard it from surrounding Dangers. It is expos'd to a thousand Wants, and so extremely sensible of the Action of other Bodies, as, soon to be destroy'd, without our Attention to preserve it. All external Bodies indeed do not affect us disagreeably; the Action of some procure us Pleasure: but such is the Condition of human Nature, that we have a quicker sense of Pain than of Pleasure; which therefore seldom compensates for it.

It was in vain that certain Philosophers maintain'd Pain to be no Evil, and suppress'd their Cries in the midst of Torments: in vain have others placed supreme Happiness in Voluptuousness, which yet they avoided, for fear of its Consequences. All of them would have shewn more Knowledge of human Nature, had they restrain'd the sovereign Happiness of this Life to Exemption from Pain; and allow'd that we can only approach this Happiness more or less, in proportion to our watchful Circumspection.

Such natural Reflections infallibly arise in every Man left to himself, free from the Prejudices of wrong Education or perverted Study. They follow as Consequences of the first Impressions we receive from Objects, and may be placed among those first Emotions of the Soul, which are so valuable to the truly Wise, and so deserving of Observation; tho' neglected, or rejected, by vulgar Philosophers, whose Principles they almost universally contradict.

*Origin of
Society and
Language.*

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The Necessity we lie under of preserving our Bodies from Pain and Destruction, obliges us to examine what external Objects may prove useful or hurtful to us; in order to secure the one, and avoid the other: but as soon as we begin to consider these Objects, we discover, amongst them, numerous Beings, appearing entirely like ourselves; their Form exactly resembling ours; and having, so far as at first appears, the same Perceptions: whence we are led to conclude they labour under the same Wants, have the same Appetites, and the same Desire of gratifying them; and consequently that we might reap great Advantages, by uniting ourselves with others of our Species, in order to discover what things in Nature tend to our Preservation, or Detriment. The Communication of Ideas is the Principle and Support of this Union; which necessarily requires the Invention of Signs: and upon this Principle is Society form'd, and Language introduced.

This Communication, which numerous strong Motives oblige us to hold with others, soon enlarges our Ideas; and produces new ones, very different, in all Appearance, from those we should have had without such Assistance. We leave Philosophers to judge, whether this reciprocal Communication, along with the Resemblance we find betwixt our own Sensations and those of the rest of our Species, does not greatly contribute to strengthen our
unfur-

unfurmoutable Propensity to ascertain the Existence of all the Objects that strike us.

And certainly the Pleasure and Advantage found in this Communication, either by imparting our Ideas to others, or by adding those of others to our own, should oblige us to an intimate Union in Society; and make us render it as mutually useful as possible.

But each Member of Society seeking his own personal Advantage, and finding an equal Desire in others to do the same; all of us cannot possibly receive an equal Share, though we have all an equal Right: and hence a Right so just, is presently invaded by that barbarous one of Inequality, or the Law of Force; the Use of which seems to level us with Brutes; and is extremely difficult not to abuse. The Strength given to some by Nature, doubtless to be employ'd for the Support and Protection of the Weak, becomes the means of Oppression: but the more violent this Oppression proves, the less patiently the Weak endure it: being persuaded, that no reasonable Motive can oblige them to submit to it. Whence arises our Notion of Injustice, and of Moral Good and Evil; the Principle of which has been so much sought by Philosophers; whereas it is the Voice of Nature, found in all Men, and extending even to Savages. This is the natural Law we find in ourselves, and the Origin of the earliest Laws form'd by Mankind. Even without these Laws, this sole Voice
of

Law of Nature.

Moral Good and Evil. Just and Unjust.

Preface by the Editors.

of Nature is sometimes so strong, as either to prevent Oppression, or, at least, to restrain it within certain Bounds. Thus the Vices of our own Species produce in us the reflex Knowledge of their opposite Virtues; a Knowledge extremely valuable, which perhaps we should not have had, if a perfect Harmony and establish'd Equality reign'd among us.

The Self-Principle.

From our Idea of *Just* and *Unjust*, and the consequent moral Nature of Actions, we are led to examine, what that acting Principle is within us, which wills and conceives. We need not examine far into the Nature of our own Bodies, and the Ideas we have of them, to discover that they are not this Principle; because the Properties found in Bodies have nothing in common with the Faculty of Willing and Thinking; consequently the Beings, call'd *Us*, consist of two Principles, different in their Nature; but so united, that the Motions of the one have a certain Correspondence with the Affections of the other, which we have no Power either to suspend or alter: and this Correspondence holds them in reciprocal Subjection to each other.

The Being of a God.

This Subjection, so independent of us, together with the Reflections we are oblig'd to make upon the Nature of these two Principles, and their Imperfections, raises us to a Contemplation of an Omnipotent intelligent Being, to whom we owe what we are; and who consequently demands our Adoration:
the

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the Knowledge of whose Existence, therefore, requires nothing more than our own internal Sentiment ; even though the universal Consent of others, and of all Nature itself, were wanting. And thus our pure intellectual Notions of Virtue and Vice, the Principle and Necessity of Laws, the spiritual Nature of our Souls, the Existence of God, and our Duty towards him ; in short, the Truths that we have the most immediate, and most indispensable Use for, are the Fruit of our first Ideas of Reflection upon those of Sensation.

How interesting soever these first Truths may be, with regard to the more noble Part of us, our Soul ; the Body, to which that Part is united, soon calls us from them, to provide for its numerous Wants. To preserve it, we must prevent the Dangers that threaten it, or remove the Evils it suffers. There are two Ways of doing this ; viz. either by Means of our own particular Discoveries ; or by those of others, made ours by Intercourse. Such is the Origin of Agriculture, Medicine, and all the Arts that are absolutely necessary, or the primitive Arts of Man ; and the Source of all the rest, though apparently ever so remote ; as will more fully appear below.

In the earliest Ages, Men, by mutually assisting each other with Information, or by joint Endeavours, seem soon to have discover'd some Purposes to which they might apply themselves : being eager after useful Knowledge, they presently quitted idle Speculations, examin'd

examin'd the different Objects of Nature, and apply'd them together, upon perceiving their most obvious, striking Properties. To this first Application, a more latent one succeeded, still relating to Man's Necessities; and principally consisting in a deeper Consideration of some less sensible Properties, in the Alteration and Decomposition of Bodies, and the Uses to be thence deriv'd.

*Curious
Discoveries.*

But in what way soever the first of our Species, and their Successors, proceeded, instigated by an Object so interesting as their own Preservation; their Experience and Observation of this immense Universe must have thrown Difficulties in their way, not to be surmounted by their utmost Efforts. Their Minds now accustom'd to Meditation, and desirous of drawing Advantage from it, must have found Resource in the Discovery of some merely curious Properties of Bodies. This is a kind of endless Discovery: and indeed if an immense Number of agreeable Facts could compensate the Want of a single useful Truth; we might say, that the Study of Nature, if it does not afford us Necessaries, at least furnishes us with a Profusion of Pleasures; thus, by a kind of barren Superfluity, imperfectly supplying the Place of Essentials.

Amusements.

In the Order of our Wants, and the Objects of our Passions, Pleasure holds one of the chiefest Places. Curiosity is a Want to the Thoughtful; especially when their restless Desire is animated by a kind of Regret, arising from

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from a Desire of entire Satisfaction: and hence we owe numerous merely pleasing Discoveries, to an unhappy Impotence of acquiring such as would prove infinitely more useful.

Another Motive to Works of Curiosity, is Pretence of Utility. To have sometimes found a real Advantage from Enquiries, where at first we did not suspect it, is sufficient to make us regard all curious Enquiries as capable of proving useful: which shews the Origin, Cause, and Progress of that vast Science call'd, in general, Philosophy, or the Study of Nature; comprehending so many different Parts, that Agriculture and Medicine, which principally gave it Birth, are now no more than Branches; which, though the most ancient, and most essential, have only been more or less esteem'd, as they happen'd to be more or less obscur'd, or kept under, by the rest.

In this Study of Nature, prosecuted partly *Common Properties.* from Necessity, and partly for Amusement, we find, that Bodies have numerous Properties; but generally so united in one and the same Subject, that to study each of them thoroughly, we are oblig'd to consider them separate. And by this Operation of the Mind, we soon discover Properties apparently belonging to all Bodies; as the Power of moving or resting, and the Communication of Motion; which are the Sources of the principal Changes we observe in Nature. Upon examining these Properties

perties by the Senses, especially the Communication of Motion, we soon discover another Property, whereon they depend, namely, Impenetrability; or that kind of Force, by which each Body excludes all others from the Place it possesses: so that two Bodies being brought as close as possible together, can never occupy a less Space than that which each separately fills.

Impenetrability.

Impenetrability is the principal Property by which we distinguish Bodies from the Parts of indefinite Space, wherein we suppose them placed; at least, our Senses oblige us to judge thus of them: and if our Senses here deceive us, it is so metaphysical an Error, that our Existence and Preservation have nothing to fear from it; whilst, by our common manner of conceiving, we constantly return to this Notion, in spite of ourselves.

Space.

Every thing induces us to look upon Space, if not as the real, yet as the suppos'd Place of Bodies; and it is, actually, by the Means of the Parts of Space, consider'd as penetrable, and immoveable, that we come at the precise Idea we can have of Motion: and are therefore naturally impell'd to distinguish, at least mentally, two kinds of Extension; the one impenetrable; the other constituting the Place of Bodies. And thus, though Impenetrability necessarily enters the Idea we have of the Parts of Matter; yet this being a relative Property, the Idea of which we only acquire by examining two Bodies together; we

Extension, of two kinds.

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we soon accustom ourselves to consider it as distinguish'd from Extension; which we can mentally abstract from Body.

In this new Consideration, we regard Bodies *Bodies distinguish'd, from Space.* only as figur'd and extended Parts of Space: which is the most general, and abstract Light they can be consider'd in: for Extent wherein we distinguish no figur'd Parts, is but like a Picture out of Sight; where the whole escapes us, because we can distinguish nothing. Colour and Figure, Properties constantly, though differently, residing in Bodies, help us to distinguish Body from Space. Nay, one of these Properties is sufficient for the Purpose; inasmuch that to consider Body in its most mental Form, we prefer Figure to Colour; whether because Figure is more familiar to us, as being distinguishable both by the Sight and Touch; or because it is more easy to consider the Figure of a Body without its Colour, than the Colour without Figure; or lastly, because Figure serves more easily, and more precisely, to determine the Parts of Space.

Hence we are brought to fix the Properties *Geometry.* of simple figur'd Extent, which constitutes the Object of Geometry; a Science that to obtain its End the better, first considers Extension limited by one, then by two, and at last by three Dimensions. These three Dimensions constitute the Essence of all mental Bodies, or Portions of Space, terminated every Way by intellectual Boundaries. And thus,

thus, by the successive Operations and Abstractions of the Mind, we divest Matter of almost all its sensible Properties; in order to examine only its Idea. The Discoveries to which this Enquiry leads, cannot fail of being extremely useful; especially as it is here unnecessary to regard the Impenetrability of Bodies: for when we contemplate their Motion, we need only consider them as figur'd and moveable Parts of Space, separate from each other.

Arithmetic.

As the Examination of figur'd Extension presents numerous possible Combinations; it is necessary to find a Means of rendering these Combinations facile. And as they principally consist in the Calculation, and Relation, of the different Parts of which we imagine geometrical Figures to be form'd; this Enquiry presently leads us to Arithmetic, or the Science of Numbers; which is no more than the Art of finding a short Method of expressing a single Relation, arising from the Comparison of many: and the different Ways of comparing these Relations, give us the different Rules of Arithmetic.

*Algebra,
and Mathematics.*

By reflecting upon these Rules, we easily deduce certain Principles, or general Properties, of Relations; and by expressing these Relations in a general Manner, we discover different possible Combinations; the Results whereof, being reduced to one general Form, are no more than arithmetical Combinations, indicated and represented by the most simple
and

and concise Expression, consistent with their Generality. The Art, or Science, of thus denoting these Relations, is what we call *Algebra*. And although, properly speaking, no Calculation can possibly be made, but by Numbers; nor any Magnitude measured but Extension, (for without Space we could not exactly measure Time) we arrive, by constantly generalizing our Ideas, at that principal Branch of Mathematics, and all the natural Sciences, call'd the *Science of Magnitude* in general; which is the Foundation of all the possible Discoveries of Quantity, or whatever is susceptible of Increase or Diminution.

This Science is the most remote End to *Recomposition of* which the Contemplation of the Properties of *Ideas.* Matter can carry us; it being impossible to go further, without entirely quitting the material Universe. But such is the Progress of the Mind in its Enquiries, that after having generaliz'd its Perceptions, so as not to be able to analyse them further; it returns back by the same Steps, recomposes its Perceptions anew, and gradually forms Ideas of such Beings; as are the immediate and direct Object of our Senses. These real Bodies being immediately relative to our Wants, we are nearly concern'd to study them. Mathematical Abstractions facilitate our Knowledge thereof; and prove only useful in Life, by this Application.

And now, after having, in a Manner, *ex-Mechanics.*hausted the Properties of figur'd Extension by

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our

our geometrical Speculations; we come back, and restore Impenetrability thereto; which constitutes physical Body, and is the last sensible Property our Abstractions divested it of. This new Consideration brings with it that of the Action of Bodies upon one another; for Bodies only act by means of Impenetrability: whence proceed the *Laws of Motion*, and *Equipollency*, which are the Object of *Mechanics*. And hence we carry our Enquiries to the Motion of Bodies, animated even by unknown Forces, or moving Causes; provided the Law whereby these Causes act, is either known, or suppos'd.

Astronomy. Upon thus returning to the corporeal World, we presently perceive the Use of Geometry, and Mechanics, in making various difficult Discoveries grounded on the Properties of Bodies; whence nearly all the Physico-Mathematical Sciences are produced: at the Head of which we place *Astronomy*; a Study, next to that of ourselves, the most worthy of Cultivation, on account of the grand Scene it opens. Astronomy joining Observation with Calculation, and illustrating the one by the other, determines, to a surprising Exactness, the Distances, and most complicated Motions of the Celestial Bodies; and assigns the Forces themselves, by which these Motions are either produced or alter'd: insomuch that this Science may be justly regarded as a sublime, demonstrative, joint Application of Geometry and Mechanics; and its Advancement

as an incontestable Monument of human Industry.

The Use of Mathematics is no less considerable in examining the terrestrial Bodies that surround us. All the Properties found in these Bodies have certain Relations to one another, more or less sensible to us. The Knowledge, or Discovery, of these Relations, is almost the only Object we can arrive at, or need propose to ourselves. It is not to be expected that amusing, arbitrary Hypotheses can help us to understand Nature; such Knowledge must be acquired by considering Phenomena, comparing them together, and reducing, as much as possible, many of them to one, as to a Principle. In fact, the more we diminish the Number of Principles in a Science, the greater Extent we give them. For, as the Object of a Science is necessarily determined, the Principles applied to that Object become so much the more pregnant, the fewer, or more general, they are made. This Art of Reduction, which facilitates the Discovery of Principles, constitutes genuine Theory; and should not be mistaken for the Spirit of building Systems; which is not always the same thing, as will appear hereafter.

But in proportion as the Object considered proves more or less abstruse, or extensive, the Reduction we speak of becomes more or less difficult: and, accordingly, we are more or less entitled to require it of Philosophers. The Loadstone, for Example, is a Subject that has

*Illustrated
in the
Loadstone.*

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been greatly labour'd, and surprising Discoveries are already made in it. Its Property of attracting Iron, and communicating the same Virtue thereto; its turning to the North, with a Variation subject to Rules, and affording as surprising a Phenomenon as a more exact Direction; its Dip to the Horizon, in an Angle greater or less, according to the Part of the Earth it stands in; are particular Properties, probably depending upon some one general Principle, or Cause, hitherto unknown. It is an Enquiry worthy of Philosophers to reduce, if possible, all these Properties to one; by shewing the Principle that connects them. But however serviceable such a Discovery might be to the Advancement of Natural Philosophy, we fear, it is not easy to make. And the same may be said of many other Phenomena, whose Connection, perhaps, belongs to the general System of the Universe. The only Method to be follow'd in such laborious, necessary, and useful Researches, is to collect as many Facts as possible; dispose them in a natural Order; and reduce them under a certain Number of principal Facts, of which the lesser should appear as so many Consequences. If at any Time we presume to rise higher, it should be with a Circumspection becoming so feeble an Understanding as ours.

*Experi-
mental
Philosophy.*

Such is the Plan to be followed in this vast Ocean of general, experimental Philosophy; which differs from the Physico-Mathematical Sciences, in being, properly, no more than a rational

rational Collection of Experiments and Observations; whereas the mathematical Sciences, by applying Calculation to Experience, sometimes, even from a single Observation, draw numerous Consequences, approaching, in Certainty, to geometrical Truths. A single Experiment upon the Reflection of Light, produced the whole Science of Catoptrics; another on the Refraction of Light, afforded the Theory of the Rainbow, the Doctrine of Colours, and all Dioptrics. From observing the Pressure of Fluids, we derive the Laws of their Equipollency, and Motion. And the single Experiment of the Acceleration of falling Bodies, led to the Laws of their falling upon inclined Planes, and to the Doctrine of Pendulums.

It must indeed be acknowledged that some Mathematicians have misapplied Algebra to Natural Philosophy. Instead of proper Experiments to ground Calculation upon, they sometimes take up with Hypotheses, commodious for their Purpose, though often foreign to what is actually found in Nature. Algebraists have been fond of reducing all to Calculation; not excepting the Art of Physic itself. That complicated Engine the human Body, has been treated by Computist Physicians, as a simple Machine, easy to analyse. It is surprising to see these Authors pretend to solve, with a Dash of the Pen, such Hydraulic and Static Problems, as might well employ the Life of an able Geometrician. For our

Misapplication of Algebra to Physics.

own Parts, either more cautious, or more timid, we look upon the greatest Part of such Calculations, and lax Suppositions, as the Sport of Fancy, to which Nature is no way obliged to submit; and conclude, that the only true Method of philosophizing in Physics, either consists in the Application of mathematical Calculation to Experiments; or in simple Observation, conducted by Method, and sometimes assisted by Conjectures for further Enquiry; scrupulously avoiding all arbitrary Hypotheses.

*Limits of
human
Know-
ledge.*

By reflecting upon what precedes, we may find two Limits, within which all our certain natural Knowledge appears to be confin'd; the one is, what we set out with, the Idea of ourselves; which leads us to that of an Almighty Being, and our principal Duties; the other is, that Part of Mathematics which has the general Properties of Body for its Object; viz. Extent and Magnitude. Betwixt these two Limits, there remains an immense Interval, wherein the Supreme Intelligence seems willing to exercise human Curiosity, by the numerous Clouds interspers'd, and certain Gleams of Light breaking out here and there, as if to allure us. The Universe may be compared to Books written with sublime Obscurity; where the Author, sometimes levelling himself to the Capacity of his Readers, seems to persuade them they nearly understand the Whole. Happy for us, who enter this Labyrinth,

Labyrinth, if we do not mistake the Path: if we should, the Light design'd to conduct, will often mislead us the more.

The little, certain, Knowledge we have, ^{Imperfection of Knowledge.} carrying us only to the two Limits above-mention'd, is far from sufficient to supply our numerous Wants. The Study of human Nature, so necessary, and so much recommended by *Socrates*, is an impenetrable Mystery to Man assisted only by Reason. The greatest Genius, reflecting upon this important Subject, seldom rises higher than to know less than the rest of Mankind. And the same may be said of our present and future Existence; the Essence of that Being to whom we owe them both; and of the kind of Worship He requires.

There is nothing, therefore, more necessary ^{Reveal'd Religion.} for us than a *reveal'd Religion*, to instruct us in essential Points; and serve as a Supplement to Natural Knowledge, by opening a Scene that was otherwise hid from our Eyes. But Revelation confines itself to what is absolutely necessary for us to know; the rest remains, and perhaps will ever remain, conceal'd. A few Truths to believe, a few Precepts to practise, make the Substance of Divine Revelation: but by means of the Light it affords, we are more confirm'd in many interesting Points, than any of the Sects of mere Philosophers.

As to the Mathematical Sciences, which ^{Different Degrees of Evidence in the Mathematical Sciences.} constitute the second Limit of our Knowledge, their

their Nature and Number should not impose upon us. It is principally owing to the Simplicity of their Object, that they are demonstrable. And as all the Branches of these Sciences have not their Objects equally simple, Demonstration (founded on Principles necessarily true and self-evident) does not equally belong to them all. Many of them rest upon Principles merely physical; such as Experiments, or mere Suppositions; and have no more than experimental, or hypothetical Certainty. Properly speaking, only those Parts that treat of Magnitude, and the general Properties of Extension, as Algebra, Geometry, and Mechanics, can be call'd demonstrative. The Light which these Sciences afford to the Mind, has a certain kind of Gradation or Shadowing; the more their Object is spread, or consider'd in a general, abstract Manner, the clearer their Principles become. Geometry is more simple and abstract than Mechanics; and Algebra more simple and abstract than either. This is no Paradox to those who have philosophically studied these Sciences. The most abstract Notions, regarded by the Vulgar as the least attainable, commonly afford the clearest Light; our Ideas become obscure in proportion as we closely examine the sensible Properties of Objects. Impenetrability, join'd to the Idea of Extension, seems like adding one Mystery to another. The Nature of Motion in Matter, is dark to Philosophers; the Metaphysical Principle

Principle of the Laws of Percussion, is as little known: and the more we examine our Idea of Matter with its Properties, the more obscure it becomes; and appears to elude our Research. We must, therefore, allow that the Mind is not equally satisfy'd with Evidence, in all the Mathematical Sciences.

To examine these Sciences, they appear, at first View, extremely numerous, or almost inexhaustible; but when ranged in Order, and brought into a philosophical List, their Number falls greatly short of Expectation. There are numerous mathematical Truths, of which little Use, or Application, is made. This indeed is no Argument against them, consider'd in themselves; but even most of the Axioms which Geometry plumes itself with, are only Expressions of the same simple Idea, under two different Signs, or Words. To say that Two and Two make Four, gives no more real Knowledge, than to say Two and Two make Two and Two. The Ideas of the Whole and a Part, Greater and Less, are, properly speaking, the same individual simple Idea; because we cannot have the one, without the other's presenting itself. Certain Philosophers observe, that many Errors are owing to the Abuse of Words; and Axioms perhaps are owing to this Abuse. We do not, however, condemn their Use; but only propose to observe its Limitation; which consists in rendering simple Ideas more familiar by Habit; and fitter for the

Mathematical Axioms and Theorems.

the different Purposes to which they are applicable. The same may be said, with proper Restrictions, of mathematical Theorems; which, when fairly considered, are reducible to a few primitive Truths. If we examine a Chain of Geometrical Propositions, so deduced the one from the other, that every contiguous two are linked together; we shall find, that they are all no more than the first Proposition successively disguis'd, in passing from one Consequence to the next; the original Proposition being no way multiplied by this Concatenation; but only appearing under different Forms: as if successively express'd in a Language, gradually changing by Time, and employing a different Phraseology, according to the different Stages it passes through; whilst each Stage remains discoverable by comparing it with that immediately preceding; but not so well by comparing it with a more remote one; tho' all the Stages depend upon each other, and design to convey the same Ideas.

*Use of
Connection
in Mathe-
matics,*

We may therefore consider the Concatenation of a Number of Geometrical Truths, as so many differently modified Translations of the same Proposition, or Hypothesis. Such Translations indeed are highly serviceable, on account of the different Applications they enable us to make of the Theorem they express: and these Applications become more or less valuable, according to their Importance and Extent. But as the real Merit of such
mathe-

mathematical Translation originally resides in the Proposition translated; this shews us how much we owe to those Inventors, who, by discovering any one of these original fundamental Truths, from whence numerous others are deriv'd, have truly enriched Geometry, and enlarged the Science.

There are also physical Truths, and Properties of Bodies, wherein we find a Connection; tho' all these Properties, well ranged together, afford us no more than one simple Truth. If numerous others appear to us detached, or separate, so as to form different Truths, this melancholy Advantage arises from the Weakness of human Understanding; our Abundance here being only the Effect of our Want. Electrical Bodies, for Example, wherein so many extraordinary, and apparently independent Properties, have been discover'd, are perhaps, in one Sense, the Bodies we least understand; though we may think we know them the best. The Virtue they acquire, by Friction, of attracting lighter Bodies, and of producing violent Commotions in Animals, appear at present two different Things, that would be but one, if we could discover their primary Cause. The Universe itself, could we reduce it to a single Point of View, would be no more than a single pregnant Fact, or immense Verity.

The different Sciences, whether useful or agreeable, hitherto mention'd, owing their Origin to our Wants, are not the only Sort

*Logic, or
the Science
of Reason-
ing.*
We

we are obliged to cultivate : there are others that relate to these, and have therefore been studied along with them. We might have described both Sorts together, did we not judge it more proper, and more suitable to the philosophical Method of this Discourse, first to consider, in an uninterrupted Series, Mens general Enquiry into Bodies, wherewith they originally began ; though along with it they soon join'd others, which we presume they pursued in the following Order. The Advantage they found upon enlarging the Sphere of their Ideas, whether by their own Endeavours, or the Assistance of others, must have led them to think of the Usefulness of reducing the Means of acquiring and communicating Knowledge, to an Art ; which was therefore invented, and call'd by the name of Logic : an Art, that teaches us to range our Ideas in the most natural Order ; to connect them closely together ; separate such as envelop too many simple ones ; examine them on all Sides, and, lastly, to lay them before others in the most intelligible Manner. And herein consists the Science of Reasoning, which may be justly call'd the Key of Knowledge ; though it did not come first in Order of Discovery. For, Reasoning is the free Gift of Nature, to Men of Genius. The common Books of Logic prove serviceable chiefly to those who might reason well without them. Many Men reason'd justly, long before Logic was reduced

reduced to Rules, teaching how to discover or gloss false Argument.

The valuable Art of connecting our Ideas, and consequently of facilitating the Transition from one of them to another, supplies us with a Means of rendering all Mens Abilities nearly equal. In Fact, all our Knowledge reduces itself to primitive Sensations, which are nearly alike in all Men. The Art of combining and connecting our direct Ideas, only gives them a more or less exact Arrangement, and Denomination; whence they become more or less sensible to others. A Man who readily combines his Ideas, differs but little from another who combines them slowly; as he who judges of a Picture at Sight, differs but little from him, who requires to be made successively sensible of all its Parts: both, at the first Glance, have the same Sensations; though they sink not so deep in the second, who therefore dwells longer upon each, to render them strong and distinct; and by this Means, the reflex Ideas of the first Observer, become as easy to the second, as direct ones. And hence, perhaps, there is scarce an Art, or Science, that may not, by Means of a well-adapted Logic, be taught to a slow Understanding; because there are few Arts, or Sciences, whose Precepts, or Rules, may not be reduced to simple Notions; and disposed in so connected an Order, that the Chain need never be broke. As the Mind is more or less slow in its Operations, it requires

quires more or less of this connected Order. The Advantage of a Genius, is that of having less Occasion for it; or rather of being able to form it quick, and almost imperceptibly.

Language. The Science of communicating our Ideas is not confined to the proper Arrangement of them; but also teaches how to express each Idea in the most exact Manner; and consequently to ascertain the Marks destin'd to convey them: which is what Mankind, by Degrees, have endeavour'd to do. Language, that began with Society, was doubtless, at first, no more, than a miscellaneous Collection of Marks; and consequently, sensible Bodies were the first Objects denoted by Names. But, in all Probability, Languages, in their first Origin, being suited only to the most pressing Occasions, must have been very imperfect, scanty, and subject to very few certain Rules: whilst the Arts and Sciences of absolute Necessity, might have made a great Progress, before any Rules of Diction, or Style, were formed. The Communication of Ideas must have been very imperfect under this Want of Rules, and Scarcity of Words; and have obliged each Individual to improve his Knowledge, by his own resolute Labour, without depending much upon others. Too facile a Communication of Knowledge may sometimes benumb the Faculties of the Mind, or prevent the Exertion of its Force: as appears from the extraordinary Things performed by Persons born blind

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blind and deaf; where we see what Resources the Mind has, when strongly exerted, and brought into Action by Difficulties to be surmounted.

But as great Advantages attend the Exchange of Ideas, by mutual Commerce; no Wonder Men should endeavour to render this Exchange still more easy. With this View, they began with reducing of Signs to Words, which are Marks, or Symbols, always ready at Hand. The Order of the Generation of Words therefore followed the Order of the Operations of the Mind; so that, after Individuals, sensible Qualities came next to be named; which, without having any Existence of their own, except in Individuals, belong in common to a great Number of them; and hence, by degrees, Men came to use certain abstract Words; some serving to connect Ideas together, others to denote the general Properties of Bodies, and others to express mere mental Notions. All these abstract Terms, which Children are so long in learning, doubtless required much Time to discover. But, at length, the Use of Words being reduced to Rule, Grammar was formed; which we may consider as a Branch of Logic. Grammar, assisted by a subtile and refined Metaphysics, determines the Shades, or Degrees, of our Ideas; teaches us to distinguish these Shades, by different Marks; affords Rules for the more commodious Use of such Marks; and, by Means of philosophical Sagacity, in tracing the
Origin

Origin of Things, often discovers the Reasons of that apparently odd Choice, which prefers one Sign to another; and leaves as little as possible to that National Caprice, called Custom.

Oratory.

At the same time that Men communicate their Ideas, they endeavour to communicate their Passions. This is performed by Means of Eloquence, or Oratory; which speaks to the Sentiments of the Heart; as Logic and Grammar speak to the Understanding. Oratory can silence Reason itself; whence the great Effects, which a single Orator sometimes produces upon a whole People, are perhaps the most glaring Instance of the Superiority of one Man over another. And here it is very surprising, that Men should ever have thought to supply the Want of this prodigious Talent by Rules; as if Genius could be reduced to Precept. He who first pretended that Orators were owing to Art, was either no Orator himself, or very ungrateful to Nature, which alone has the Power of making an Orator. Men are the first Book to be studied by Orators; and the great Masters of the Art are the second. All that the most illustrious Writers have left us, of the philosophical and reflex Kind, upon the Talents of an Orator, shews us no more than the Difficulty of becoming one. They were too sensible to pretend they could deliver the Science; and doubtless meant only to mark the Flats and Shallows of it. As to those pedantic Puerilities,

ties, honoured with the Name of Rhetoric, *Rhetoric.* they serve rather to render that Name ridiculous. They are to the Art of Oratory, no more than the Doctrine of the Schoolmen is to true Philosophy; and so calculated as to give an extremely false and gross Idea of Eloquence. And though this Abuse of Rhetoric begins to be generally allowed, the Rank it has long held, as a distinguishing Branch of Knowledge, does not yet suffer it to be exploded: but perhaps that Time may come, to the Honour of human Understanding.

Man is not contented to live and reign a- *History.* mong his Contemporaries alone, but, drawn by Curiosity, and Self-love, eagerly and naturally endeavours, at once to embrace the past, the present, and the future Times. We desire, at once, to live both with our Successors and Predecessors. This shews us the Origin, and Design, of History; which unites us with the Ages past, by representing their Vices, Virtues, Knowledge, and Errors; and transmitting our own to Posterity. It is by History we learn to esteem Men only for the Good they do; and not for the seducing Pomp that surrounds them. Sovereigns, who are so unhappy as to be excluded from Truth on all Sides, may here pass Sentence upon themselves beforehand: for History is a tremendous, uncorrupt Tribunal; which judges their resembling Predecessors just as it will do them.

*Chronology
and Geo-
graphy.*

Chronology and Geography are two Appendages, or Supporters, of History: the one fixing the Inhabitants of the Earth in Point of Time; and the other assigning their Place upon our Globe: they both derive great Advantages from the History of the Earth, and Heavens; or from historical Facts, and celestial Observations; and may therefore be regarded as Descendants of Astronomy and History.

*Civil Po-
licy.*

It is one principal Advantage arising from the History of Empires, and their Revolutions, to see how Mankind, separated as it were into numerous large Families, formed different Societies; how these Societies gave Rise to different Kinds of Government; and how each People endeavoured to distinguish themselves from the rest by Laws; and by particular Signs, as the Means of more easily communicating their Thoughts: whence arose that great Diversity of Languages and Laws, which, to our Misfortune, is become a principal Object of Study. Hence also we see the Origin of *Civil Policy*, as a particular and higher Kind of Morality; to which it is sometimes difficult, without straining, to accommodate the Principles of common moral Duty. For, *Civil Policy*, entering into the principal Motives of Government, aims at discovering what may tend to preserve, weaken, or destroy a State. This is perhaps the most difficult Kind of Study. It requires a deep Knowledge of Mankind in general, and of the People to be governed, in particular;

particular ; as also a great Compass and Variety of Abilities : especially if the Politician would not forget that the Law of Nature, being prior to all particular Affociations, is the first Law of the People ; and that his being a Statesman, does not preclude his being a Man.

These are the principal Branches of that *Arts of Imitation.* Portion of human Knowledge, which consists either in the Ideas we receive directly by the Senses, or in the Combination and Comparison thereof : which Combination is in general called *Philosophy*. These Branches subdivide themselves into such a prodigious Number of others, that the Enumeration of them rather belongs to the Encyclopædia itself, than to its Preface. We set out with considering the first Operation of Reflection ; which consists in collecting and uniting our direct Notions ; and have touched upon the different Sciences thence produced : but the Notions formed by the Combination of our primitive Ideas, are not the only Sort of which the Mind is capable. We are next to consider another Kind of reflex Knowledge, consisting in the Ideas we form to ourselves, by imagining and comparing Things, as they resemble the Objects of our direct Ideas : this makes what is called the *Imitation of Nature*, so well known, and so much recommended, by the Ancients. As the direct Ideas which strike us strongest, are those we remember best ; so we the more earnestly endeavour to reproduce them in ourselves, by imitating their Objects. And though agreeable

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Objects

Objects strike us stronger when real, than when barely represented; yet this Defect in Point of Agreeableness, is, in some Degree, made up by the Pleasure we receive from their Imitation. On the other Hand, though certain real Objects excite melancholy, or distressful Sentiments in us, the Imitation of them proves more agreeable; as placing us at such a just Distance, that we receive the Pleasure of the Emotion, without the Disorder. And in this Imitation of all Kinds of Objects, capable of raising lively or agreeable Sentiments in us, consists, in general, the Imitation of beautiful Nature; upon which, so many Authors have wrote, without being precise: perhaps, because it requires exquisite Sentiment to determine what beautiful Nature is; or because the Limits that distinguish what is arbitrary from what is just, are not hitherto well ascertained; and therefore leave some Liberty to Opinion.

*Painting
and Sculpture.*

In the List of the Arts of Imitation, *Painting and Sculpture* stand first; as being those wherein Imitation comes nearest to the Objects they represent; and speaking the most directly to the Senses. To these we may add *Architecture*; an Art produced by Necessity, and perfected by Luxury; as having risen, by Degrees, from Cottages to Palaces; and being, to a philosophical Eye, no more than an embellished Disguise of one of our greatest Wants. The Imitation of beautiful Nature is here less striking, and more confined,
than

than in Painting, or Sculpture; which indiscriminately express, without Restraint, all the Parts of beautiful Nature, by representing her as she is, either uniform, or with Variety: whereas Architecture is constrained, in disposing and uniting the different Materials it employs, to imitate that Symmetry, which Nature observing, more or less visibly, in the Structure of each Individual, produces so fine a Contrast with the beautiful Variety of the Whole.

Poetry, which succeeds to Painting and Sculpture, employs, in its Imitations, Words so disposed as to make agreeable Harmony to the Ear; but speaks rather to the Imagination than to the Senses; and thus presents, after a strong and lively Manner, all the Objects in the Universe; and appears, by the Glow, Motion, and Life it gives, rather to create than paint them.

Music, which at once speaks both to the Imagination and the Sense, comes next among the Arts of Imitation: not that its Resemblance is less perfect than theirs, with regard to the Objects it would represent; but because it has been confined to fewer Images. But this should not be attributed so much to its Nature, as to the Want of Invention and Contrivance in most of its Professors; as may appear by the following Reflections.

Music, in its Origin, perhaps, meant no more than to represent Sound; but is gradually become a Kind of Discourse, or Language,

capable of expressing the different Sentiments, or Passions, of the Soul; and might, perhaps, be brought to represent Sensations. For although the Perceptions we receive by our different Organs, differ as much as the Objects; yet they may be viewed in a Light common to them all; viz. the State of Pleasure, or Pain, they put the Soul in. A frightful Object, and a terrifying Noise, produce similar Emotions in us; which we often denote by the same, or synonymous Names. Why may not therefore a Musician, who has a frightful Object to paint, succeed in discovering, in Nature, a Kind of Sound, capable of producing in us an Emotion, nearly resembling that excited by such an Object of Sight? And the same may be said of agreeable Sensations. To judge otherwise of Music, is confining the Art, and our own Pleasures, within narrow Bounds. Indeed the Kind of Painting here meant, requires a refined and strict Attention to the Shades which distinguish our Sensations; and therefore can scarce be expected from an ordinary Genius; for, though Men of Penetration may discover them, Men of Taste perceive them, and Men of Refinement trace them, yet they are lost to the Multitude. The Music that paints nothing, is no better than Noise; and if it were not for Habit prevailing over Nature, such Music would scarce give more Pleasure, than a Number of harmonious Words sounded without Order, and without Connection. Indeed a Musician, by
studying

studying to paint every Thing, might, in many Respects, present us with harmonious Pictures unsuited to the vulgar Senses : but the only Conclusion to be made from hence is, that, after finding the Art of playing such Music, another Art must be introduced of hearing it.

And here we conclude our Enumeration of the principal Branches of human Knowledge. To consider them all together, and search for the general Views that serve to distinguish them, we shall find that some of these Branches are entirely practical; and have the Execution of some Design for their End : that others are merely speculative, or confine themselves to the Examination of their Object, or the bare Contemplation of its Properties ; and that a third Sort, from the Speculation of its Subject, derives a practical Use.

Theory and Practice principally distinguish *Arts and Sciences distinguished,* Sciences from Arts ; and accordingly, most Branches of Knowledge pass under the one, or other of these Names ; though we must allow, that our Ideas are, in this Case, not hitherto sufficiently precise : for we are often at a Loss in naming such Branches of Knowledge where Speculation is joined with Practice. It is frequently disputed in the Schools, whether Logic be an Art, or a Science. The Question might easily be determined by saying, it is both. It would save Time, and much Altercation, if Words could be brought to a clear and precise Signification.

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In general, the Term, Art, may be given to any Portion of Knowledge, capable of being reduced to determinate invariable Rules, independant of Caprice or Opinion. In this Sense, several Sciences, considered in their practical Use, may be termed Arts. There are Rules for the Operations of the Mind; and others for those of the Body, the Operations whereof, being confined to external Subjects, require no more than the Assistance of the Hand to perform them. Hence proceeds the Distinction betwixt the Liberal and Mechanic Arts; and the Preference given to the former; though very unjustly in many Respects. But however ridiculous Prejudices may be, every one of them has its Cause or Origin; which Philosophy may discover, though unable to correct the Abuse. Violence being the Principle which renders the Law of Equality useless; the Weak, who are always the most numerous, unite to oppose it; and by Means of Laws, and different Forms of Government, establish in Society an Inequality, of which Force is not the Principle. This Law of Inequality once established, the Members unite to preserve it by Reason; but cannot prevent a secret Repining, from the unsurmountable Desire we have of Superiority; and therefore seek Resource in a less arbitrary Inequality. And Violence being restrained by Laws, so as to afford no Means of exerting a Superiority; we are obliged to seek for a natural, more pacific, and more useful Principle of Inequality,

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in the Difference of Mens Capacities : whence the Mind, in some Measure, is repaid those Advantages usurped by the Body ; and the mental Talents generally acknowledged superior.

The mechanic Arts, depending upon manual Operation, and confined to a certain beaten Track, are assigned over to those Persons whom Prejudice places in a lower Class. Necessity, rather than Taste and Genius, compelling them to this Occupation, became, in Time, a Cause of Contempt : so detrimental is Indigence to those it attends : whilst the free Operations of the Mind were left to others, who thought themselves more favoured by Nature. But the Advantage of the liberal over the mechanic Arts, from employing the Operations of the Mind, and from the Difficulty of excelling therein, is sufficiently compensated for, by the greater Utility, most commonly arising from the mechanic Arts. This very Utility reduces them to mere mechanical Operations ; in order to facilitate their Practice, among a greater Number of Hands. Thus Society may have a just Regard for its enlightening Geniuses ; without debasing the Hands that serve it. The Discovery of the Mariner's Compass is not less serviceable to Mankind, than an Explanation of the Properties of the Needle would be to Philosophy : and according to the Grounds of Distinction above-mentioned, the Learning of many is little more than mechanical. What is the real Difference betwixt a Head furnished with a Chaos of useless unconnected Facts, and

and the Instinct of an Artisan, displayed in mechanical Execution?

The Contempt thrown upon mechanic Arts, seems, in a Degree, to reach their Inventors. The Names of these Benefactors to Mankind, are rarely heard of; whilst the great Destroyers of our Species, called Conquerors, are universally known. Yet we find, among Artisans, many extraordinary Proofs of Sagacity, Genius, Affiduity, and Invention. Most Arts indeed are discovered by Degrees; and Ages have been employed in bringing some of them to Perfection: as we remarkably find in Watch-Work. And the same may be said of the Sciences. How many Discoveries, which have immortalised their Finishers, were begun, and continued by the Labours of preceding Ages? Some of them, already brought near to Perfection, might require little more than a single Addition. Should not the Inventors of the Spring, the Chain, and repeating Parts of a Watch, be equally esteemed with those who have successively studied to perfect Algebra? But though the Contempt cast upon Arts, may not have hindered their gradual Improvement; yet there are certain Machines so complicated, and their Parts so much depending upon one another, that it is hard to conceive they should have been invented by different Persons. Such extraordinary Inventors, instead of having their Names buried in Oblivion, might well deserve a Place among the few Discoverers who strike out new Paths of Science.

Among

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Among the liberal Arts reduced to Principles, those that make the Imitation of Nature their End, are called Arts of Elegance; and have Agreeableness for their principal Object. But this is not the only Particular that distinguishes them from the more necessary, or more useful, liberal Arts, Grammar, Logic, and Morality; which have their fixed and determinate Rules, capable of being transmitted from one Man to another: whereas the Practice of the Arts of Elegance principally consists in Invention; and derives its Laws from Genius. The Rules laid down with Respect to these Arts, properly regard their mechanical Part; and are therefore like Telescopes, which assist only those who have Eyes.

It follows from the preceding Discourse, that the different Ways, in which our Mind operates upon Objects, and the different Uses it derives from thence, are the first Means of distinguishing, in general, our different Kinds of Knowledge from each other; and that the Whole of it relates to our Wants, either of Necessity, Convenience, Amusement, real Use, or capricious Abuse. The more remote our Wants are, or the more difficult to supply; the more slow is the Progress of our Knowledge. What Advances would the Art of Physic have made, to the Discredit of Sciences merely speculative, were its Principles as certain as those of Geometry?

But

*Its Kinds
or Modes.*

But there are, besides these, other strong Marks, or Differences, taken from the Manner wherein our Knowledge affects us; or the different Judgments we make of our Ideas. Intuition, Demonstration, Probability, Sensation. These Judgments are denoted by the Words

Intuition.

Intuition properly belongs to those Ideas, or Propositions, betwixt which the Mind immediately perceives a Connection. But where the Connection does not appear, with-

Demonstration.

out the Assistance of intermediate Ideas; or when the Propositions are not found to have an identical Agreement with the same self-evident Principle, but by Means of a Chain of Reasoning, it is then called Demonstration. And hence, according to the different Nature of Mens Minds, a Proposition self-evident to one, may be only demonstrative to another. But, taking the Term in a different Sense, we might say that Intuitive Evidence is the Result of the mere Operations of the Mind, employed in metaphysical and mathematical Speculations; whilst Demonstration regards physical Objects, our Knowledge whereof arises from the constant and invariable Relation of our Senses.

Probability.

Probability principally takes place in Historical Facts, and in all Events, whether past, present, or future, which, for want of knowing their Cause, we usually ascribe to Accident. But although the History of present, or past Transactions, rests upon bare Testimony; yet it

it often produces as strong a Persuasion in us as Axioms.

Sentiment is of two Kinds; moral, and elegant. *Sentiment*
The first regards moral Truths, and *moral*,
makes what we call Conscience; which is a
Consequence of the Law of Nature, and of the
Ideas we have of Good and Evil; whence it
might be called the Evidence of the Heart:
for although it differs greatly from the Evi-
dence of the Understanding, which regards
speculative Truths; yet it has as great an Ef-
fect upon us.

The other Kind of Sentiment is restrained to *and ele-*
beautiful Expression, and the Imitation of beau- *gant*.
tiful Nature. This catches, with Transport,
all sublime and striking Beauties; discovers,
with Elegance, such as lie concealed; and re-
jects all false Appearances and Pretensions.
It often condemns at once, without assigning
the Reasons; which require much Time to
explain, and render intelligible to others. To
this Kind of Sentiment we owe what is called *Taste and*
Taste, and Genius; which only differ, as Ge- *Genius*.
nius is creative, and Taste judicial Sentiment.

After this Enumeration of the different Parts *The Ency-*
of our Knowledge, and their distinguishing *clopædiac*
Marks, it remains that we form them into a *Order*.
Kind of philosophical Table, or systematical
Tree of Knowledge, which may represent
them all in one View; so as to shew their
Origin, Relation, and mutual Connection.
The Use of such a Contrivance will presently
appear; but the Execution is attended with
Difficulties.

Difficulties. Indeed, the preceding History of the Origin of our Ideas, will help us herein; though it would be absurd, and impracticable, servilely to follow the Thread of that History, in forming our Plan. A general System of Arts and Sciences is a Kind of Labyrinth, which the Mind enters without well knowing what Path to take: pressed by its own Wants, and those of the Body, it fixes on the first Objects it meets; proceeds, as far as it can, in understanding them; but soon meets with Difficulties to stop its Progress; and either in Hope, or Despair, of conquering them, strikes into a new Track; returns afterwards by the Way it went; but no sooner surmounts the first Difficulties, than it meets with fresh; and courting about from one Object to another, makes upon each a Series of different Attacks, which the very Generation of its Ideas necessarily interrupts. This Disorder, however philosophical in the Mind, is sufficient to disfigure, or abolish any genealogical View of the Arts and Sciences.

Again, we have already seen, under Logic, that most of the Sciences which include the Principles of others, and therefore ought to have Preference in philosophical Order, hold not the same Rank in the genealogical Order of our Ideas; as not being first invented. In fact, Man's primitive Study must have been the Study of Individuals; and after examining their particular obvious Properties, came the abstract Consideration of their general Properties,

Properties; which formed Metaphysics and Geometry. It was long after the Use of primitive Signs, that Man so far improved the Art of Signs, as to form it into a Science. It was after a long Series of Operations on the Objects of Ideas, that Men, by Reflection, formed Rules for such Operations.

In short, the System of our Knowledge is composed of different Branches; many of which unite in one Point. And as it is impossible, by beginning from the same Point, to trace all the different Branches; it must be the different natural Turn of Mens Minds that determines their Choice; and consequently very few can usefully pursue numerous Branches. Many, at first, applied themselves, in Concert, to the Study of Nature, in order to supply their most pressing Wants; but when they arrived at Parts of Knowledge less absolutely necessary, these were divided, and each pursuing his own, a Number of them were almost equally improved at once. But though several of the Sciences were thus cultivated together; the historical Order, in which they must be described, is necessarily successive.

The systematical Order of our Knowledge is a different Thing; and consists in contracting the whole of it within the narrowest possible Bounds; and placing the Reader on an Eminence above this vast Labyrinth, so that he may view all the principal Arts and Sciences at once; discover, by a single Glance, the Objects of Science, and the Operations to be

be performed upon them; distinguish the general Branches of Knowledge, their Points of Union, Separation, or Intersection; and even perceive the secret Paths that join them. Such a System should resemble a Map of the World, that shews the principal Countries, their Situation and mutual Relation; together with the direct Roads that lead from one to the other: though these Roads are frequently interrupted, and so obstructed, that none but the respective Inhabitants, or experienced Travellers, can know them: nor can they be described but in the particular Maps of each Country. The different Articles of our *Encyclopædia* make such particular Maps; and the philosophical Tree, or emblematical System, forms the general Map of the whole Globe.

But, as in general Maps of the World, Objects are placed nearer or more remote, and appear differently, according to the Point wherein the Eye is supposed to be placed; so the Form of our Systematical Tree will vary, according to the Point from which we view the World of Science. We may therefore figure to ourselves as many different Systems of Knowledge, as there are general Maps of different Projections: and each System may have some Advantage over the rest. Every Man perhaps would place his own favourite Science in the Centre of all the Sciences; as the earliest Ages, fancying the World was made for them, placed themselves in the Middle of it. And many of these Pretensions
considered

considered in a philosophical Light, might, without Partiality, appear to be well grounded.

Doubtless, among all the Sorts of systematical Plans of Knowledge, that should be preferred, which takes in the most Connections and Relations between the Sciences. But, who can flatter themselves to have found it? We cannot inculcate too often, that Nature is wholly composed of Individuals; which are the primitive Objects of our Sensations, and direct Perceptions. In these Individuals we observe certain common Properties, by Means whereof we compare them; and certain dissimilar Properties, by which we distinguish them; and by assigning abstract Names to these Properties, we are enabled to distribute Objects under different Classes. But as an Object, which, on Account of some Properties, comes to be ranged in one Class, has others which equally entitle it to another; general Divisions must needs be arbitrary Things. The most natural Arrangement would be, to make Things succeed each other in gradual Shades, or scarce discernible Transitions; which at once might serve to separate and unite them: but the scanty Number of the Things we know, will not permit us to discern these Shades. The Universe resembles an immense Ocean, where we see Islands of different Sizes above the Surface; but cannot discern their Connection with the Continent.

A systematical Plan of human Science *Arbitrary*
might be formed, by dividing it either into *Divisions*
D natural *of Knowledge.*

natural and revealed; or into useful and agreeable; or into speculative and practical; or into evident, certain, probable, and sensible; or into the Knowledge of Things, and the Knowledge of Signs; and so *in infinitum*: but we have chose such a Division as appeared, at the same Time, most suitable both to the systematical and genealogical Order of human Science. We owe this Division to a very great Author, whom we shall mention below; together with the Alterations we found it necessary to make therein. But we are too sensible how arbitrary all Divisions of the Arts and Sciences must ever be, to imagine ours the best or only System: we shall rest satisfied if it be not disapproved by the Intelligent. We would not resemble those Naturalists, justly censured by a modern Philosopher, who waste that Time in ranging the Productions of Nature according to *Genus* and *Species*, which might be better employed in studying the Productions themselves. He must be a ridiculous Architect, who, having a grand Edifice to raise, should spend a whole Life in barely tracing the Plan: or a strange Virtuoso, who purposing to survey a Palace, should proceed no further than its Avenue.

*Faculties
of the
Mind.*

Memory.

The Objects of our Minds are either spiritual or material; and we are employed about them by Means of direct or reflex Ideas. Our Stock of direct Knowledge consists of a merely passive, or mechanical, Collection of Things treasured up in the Memory.

Reflection,

Preface by the Editors.

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Reflection, as we observed above, is of two *Reasoning* Kinds; and either reasons upon, or imitates, the Objects of our direct Ideas. Hence the Mind operates in three different Ways on the Subject of its Thoughts; viz. either by Memory, Reasoning, or Imagination.

By Imagination we do not mean the Fa-*Imagina-* culty of recollecting sensible Objects; this is *tion* no more than Memory; which, were it not for the Use of Signs, must be in continual Exercise; but we take the Word, in a higher, explicit Sense, for that Faculty in us which creates Objects by Imitation.

These three Faculties form the three general Divisions of our System, and the three general Objects of human Knowledge, viz. History, which relates to Memory; Philosophy, which is the Produce of Reasoning; and the Polite Arts, which spring from Imagination. Reasoning, according to the natural Progress of the Operations of the Mind, is properly placed before Imagination; which is a creative Faculty: but the Mind, before it thinks of creating, reasons upon what it sees and knows. Another Motive for placing Reasoning before Imagination is, that Reasoning and Memory unite, to a certain Degree, in forming the Imagination. The Mind creates or imagines Objects, only resembling those it already knows by direct Ideas and Sensations: the more it departs from these Objects, the more strange and disagreeable Likenesses it forms. Hence even Invention is

subject to certain Laws in imitating Nature ; which Laws chiefly constitute the philosophic Part of the Polite Arts ; though at present it is but little known ; as being only the Work of Genius, which rather delights in creating than discerning.

In short, if we examine the Progress of our rational Faculty, in its successive Operations, we shall find it plainly precedes Imagination ; because the ultimate Operations which Reasoning performs upon Objects, lead, in some Sort, to Imagination. For, these ultimate Operations consist in the Formation of general Notions, which, separated from their Subject by Abstraction, no longer remain immediate Objects of our Senses. And hence, of all the rational Sciences, Metaphysics, and Geometry are those, where Imagination has the greatest Share. This is spoke with Submission to Wits, who despise Geometricians ; not considering how nearly the two are allied ; as being perhaps divided only by the Intervention of Metaphysics. The Imagination of a Geometrician who discovers, is as active as a Poet's who invents ; though they operate differently upon their respective Objects. The Geometrician simplifies and analyses ; whilst the Poet composes and adorns. These different Operations also belong to different Kinds of Geniuses ; whence, possibly, the Talents of a great Geometrician and of a great Poet will never be found united. But whether the one excludes the other, or not, they have doubtless no

Right

Right to despise each other. Among the great Geniuses of Antiquity, perhaps *Archimedes* best deserves to be ranked with *Homer*. This Digression, we hope, may be excused in a Geometrician, who loves his Science; but would not be thought its blind Admirer.

The general Distribution of Subjects, into Spiritual and Material, forms the Subdivision of the three general Branches of our Knowledge. History and Philosophy equally regard both; whilst Imagination wholly operates upon the Plan of material Objects: whence we have another Reason for placing it last in the Order of our Faculties. At the Head of spiritual Beings stands God; who holds the first Place by his Nature, and the Necessity we have of knowing Him. Next to this supreme Being, come created Spirits; whose Existence we are taught by Revelation. In the next Place comes Man; composed of two Principles, Body and Soul; his Soul participating of a spiritual Nature, and his Body of the material World. Lastly comes this immense Universe; which we call the corporeal World, or Nature. We see not why the great Author above-mentioned, who is our Guide in this Distribution of Knowledge, should in his System place Nature before Man; as it appears more just to assign Man's Place in the Interval which separates God, and Spirits, from material Bodies.

History, as it relates to the supreme Being, includes *Revelation*, and *Tradition*; and is

*To Memory
belong Re-
velation
and Tra-
dition.*

accordingly divided into sacred and ecclesiastical. The *History of Man* hath human Actions; and human Knowledge, for its Object; accordingly is either civil or literary; and treats of powerful Nations, and great Geniuses; Potentates, and Men of Letters; Conquerors, and Philosophers. Lastly, the *History of Nature* is the History of the numerous Productions of Nature; and forms almost as many Branches as there are different Productions in Nature: but among the rest, a principal Branch is the *History of Arts*; or the different Purposes to which Men have applied the Productions of Nature, either in the View of Utility, or Curiosity. And so much for the principal Objects of the Faculty of Memory.

To Reason-
ing belongs
primary
Philosophy,
or Ontology. We next proceed to the reflecting, reasoning Faculties of Man. Both spiritual and material Beings, which are the Objects of this Faculty, having certain general Properties, such as Existence, Possibility, and Duration; the Consideration of these Properties immediately forms Ontology, or that Branch of Philosophy, from which all the rest borrow some Part of their Principles: because it includes the Science of Being, in general, or Metaphysics at large. From Ontology in general, we descend to all the different particular Beings; and the Divisions, afforded by this Science of particular Beings, form themselves upon the same Plan with the Divisions of History.

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Our Knowledge of God, which passes under the Name of Theology, divides itself into two Branches; Natural and Revealed. ^{Theology, natural and revealed.} Natural Theology, or the Knowledge we have of God, by Reason alone, is very confined; but Revealed Theology derives a more perfect Knowledge of Him from Scripture. Man likewise owes his Knowledge of created Spirits to Revelation. And here, again, we found ourselves obliged to depart from our Guide; judging that this Science, considered as relative to Reasoning, should not be divided, after his Manner, into Theology and Philosophy; because revealed Theology is no more than Reasoning applied to the Facts revealed; and may be said to participate of History in respect of the Doctrine taught; and of Philosophy with regard to the Inferences thence deduced: so that to separate Theology from Philosophy, is to tear a bearing Branch from the Tree. It appears also, that we more immediately derive our Knowledge of Spirits from revealed, than from natural Theology.

A principal Part of human Knowledge is the Knowledge of our Souls; consisting in the speculative Knowledge of the Soul itself, and of its Operations. ^{The Doctrine of the Soul.} The speculative Knowledge of the Soul participates both of natural and revealed Theology; and is a Branch of Metaphysics, called Pneumatology. The speculative Knowledge of the Soul's Operations is subdivided into two Branches; as its Object is either the Discovery of Truth, or

the Practice of Virtue. The Discovery of Truth, which is the End of Logic, constitutes the Art of conveying Truths to others: and hence the Use we make of Logic is in Part for our own Sakes, and in Part for the Sake of others. The Rules of Morality do not chiefly regard Man in a solitary State; but suppose him necessarily linked in Society.

*Natural
Philosophy.*

The Knowledge of Nature is the Knowledge of Bodies, and their general Properties, such as Impenetrability, Mobility, and Extension, which are the first to be studied in Natural Philosophy. These general Properties, being considered abstractedly, open an immense Field for Speculation; and when considered materially they become the Objects of Mensuration. Pure Speculation belongs to general Physics, or the Metaphysics of Body; and Mensuration is the Object of Mathematics, the Divisions and Applications whereof are almost infinite.

These two Sciences lead to particular Physics, or Natural Philosophy, which considers Bodies as they are in themselves; and has Individuals for its Object. Among these the human Body is that whose Properties we are principally concerned to know; and next after this come such as are necessary to our Preservation: whence proceed Anatomy, Agriculture, Medicine, and their different Branches. In short, all the natural Bodies subject to our Examination, furnish the other numerous Branches of natural Philosophy.

Painting,

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Painting, Sculpture, Architecture, Poetry, ^{The Arts} and Music, with their several Branches, form ^{belonging} the third general Division, which refers to ^{to the Imagination.} the Imagination; and are all comprehended under the Title of Polite Arts. They might also be included under the general Name of Painting; because all the Polite Arts are reducible to Painting; and differ only in regard to the Means they employ. Or indeed they might all be referred to Poetry; taken in its natural Signification, for Invention or Creation.

These are the principal Parts of our systemat- ^{Systemati-} cal Plan of the Arts and Sciences; a ^{cal Plan} larger Detail whereof will appear below, in ^{of the} Form of a Map, with its particular Explanation. This Map, and its Explanation, was published, by Way of Specimen, in our *Proposals*. We have since made some Alterations therein, as will easily be perceived. These Alterations arose from our own subsequent Reflections; or the Advice of certain learned Gentlemen, whose Concern for the public Good interested itself in the Success of our Work. If these Alterations please the Judicious, we shall count it a happy Reward of our Docility: if they should displease, this will but more convince us of the Impossibility of ranging the Arts and Sciences in an Order suited to every Taste.

The general Division of Knowledge, according to the three Faculties of our Minds, ^{The Literary World} enables us to make a correspondent Division ^{classified.} of the Literary World, into Men of Erudition,

tion, Philosophers, and Wits. Memory is the predominant Talent of the first, Sagacity of the second, and Pleasing of the third: so that, taking Memory for the Beginning of Reflection, and adding the combinatory and imitatorial Parts thereto; it may be said, in general, that the Difference betwixt Men consists in the Nature and Number of the Ideas of Reflection each Man has respectively; and that Reflection alone, taken in its most extensive Sense, forms the Character, or specific Differences, of Mens Minds.

These three Republics, into which we divide the Literary World, have scarce any Thing in common besides a mutual Contempt for each other. The Philosopher, and the Poet regard each other as Frantics, fed with Chimera's. They both agree that the Man of Erudition is a Miser, hoarding Wealth he never enjoys; and treasuring up the basest as anxiously as the most valuable Coin. The Man of Erudition, regarding the finest Productions of Genius, without Facts, but as mere Groups of Words, equally despises Poets and Philosophers, for fancying themselves rich, only because their Expences out-run their Income. And in this Manner it is, that Men endeavour to make their own Deficiencies good.

But the Learned would better consult their Interest, if, instead of pretending to stand separate, they mutually supported each other. Society is certainly indebted to the Polite Arts

Arts for its principal Pleasures, and to Philosophy for its Knowledge: but both these are greatly beholden to Memory, which preserves the original Matter of all our Knowledge. The Labours of the Learned have furnished many a Subject for Philosophers and Poets to work on. The Ancients, says a Modern, by styling the Muses Daughters of Memory, thereby shewed how necessary they thought it to the other Faculties of the Soul. The *Romans* built Temples to Memory, as well as to Fortune.

We proceed to shew in what Manner we propose to employ the systematical, along with the alphabetical Order, in the Execution of our Encyclopædia. The systematical Table to be here subjoined; the Science to which each Article belongs; and the Manner wherein each Article is treated, are the three Means made Use of for this Purpose. Immediately after the Word, which makes the Subject of any Article in our Dictionary, is usually added the Science it belongs to: so that we need only examine where the Science stands in our systematical Table, to know the Place of the Article in our Encyclopædia. If the Name of the Science it belongs to should be omitted, the Perusal of the Article will sufficiently mark the Science. Suppose it should be omitted, that the Word *Bomb* belongs to the Art of War; or that the Name of any City or Country belongs to Geography; we may safely trust this Omission to the Understanding of the Reader.

Besides,

Besides, the Matter of each Article, especially when of any considerable Length, is disposed in such a Manner, as must necessarily discover its Relation with other Articles, belonging to different Sciences.

*The Refer-
ences and
Connec-
tions.*

We have been particularly careful with regard to the References; which in our Dictionary serve to shew the Connection betwixt the different Articles: whereas, in other Works of this Kind, References are only made Use of to explain one Article by another. Indeed we frequently omit the Reference; because the Terms of Art, that should otherwise be referred to, are explained under their proper Article, which the Reader of course will turn to. It is under the general Articles of the Sciences, that we principally endeavour to shew the mutual Assistance they afford each other. Three Things therefore contribute to form the systematical Order; viz. the Name of the Science to which the Article belongs; the Place of this Science in the systematical Table; and the Connection between one Article and another, in the same or a different Science: which Connection is either indicated by References; or easily perceived by the technical Terms, explained in their own alphabetical Order. Our Reasons for preferring the alphabetical Order to any other, will appear hereafter, when the whole Assemblage comes to be considered as a Dictionary of Arts and Sciences.

The

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The systematical Order of our Work regards the Use of the Learned, more than the ^{Use of the} Vulgar. And here we have two Observations ^{systemati-} to make; viz. (1) it would often be absurd, ^{cal Order.} to search for an immediate Connection between one casual Article of this Dictionary and another; as between *Conic Sections* and *Accusative Case*. Our systematical Order does not suppose that all the Sciences are immediately connected in every Part: they are only Branches from the same Stem of human Understanding; and few of them unite except in the Stem itself. *Conic Sections* belong to Geometry, Geometry leads to Natural Philosophy, this to general Physics, this to Metaphysics, which approaches Grammar, whereto the Word *Accusative* belongs. But after being got thus far, in this Manner, we are so remote from the Point we set out at, as to have lost the Sight of it.

(2) Our systematical Table should not be taken for more than it pretends to be. The Design of general Divisions is to bring numerous Objects together in a Group; without at all comprehending the Particulars to be known of each. They only afford a Glance of attainable Knowledge, and are of little Service to such as rest in them; but prove highly useful to those who aim at making a further Progress. A single well-digested Article, on the particular Object of an Art or Science, is of more Consequence than all the possible Divisions and Subdivisions of general Terms.

Terms. He who confines his Knowledge to systematical Divisions, may know as little of Arts and Sciences, as another, who, from Maps, has only a general Idea of the World and its Quarters, does of the different People, and Nations of the Globe. It should be carefully remembered, that the systematical Order differs greatly from the genealogical Order of the Mind's Operations; that the Sciences which treat of Beings in general, are only useful so far as they lead to Particulars; that only Particulars really exist; and that our Minds form general Ideas only to facilitate the successive Examination of Properties, which necessarily exist together in the same Subject. These Reflections naturally arise from what precedes: and here we conclude the first Part of our Preface.

The Encyclopædia considered as a Dictionary of Arts.

WE now proceed to consider our Encyclopædia as a systematical *Dictionary of Arts and Sciences*. This Part is of the greater Importance, as it concerns the greater Number of Readers; and therefore requires more Conduct and Industry in its Execution. To prepare the Way for our Purpose, we should enquire into the present State of the Arts and Sciences; and shew by what Steps they arrived at this State. The metaphysical History of the Origin, and Connection, of the Sciences has been of great Use to us in forming our systematical Table; and an historical Explanation of the Order, wherein the several Parts of our Knowledge succeed each other, will
prove

as serviceable in directing us how to lay them properly before the Reader. The History of the Sciences is also naturally connected with the History of those few Men of extraordinary Genius, whose Works have illuminated the World, and supplied us with general Directions in our Undertaking; and who therefore deserve our particular Acknowledgement, before we mention the Advantages they have afforded us.

To keep within tolerable Bounds, let us begin with the Revival of Learning, and examine the Progress of Mens Minds since that memorable Æra. It is obvious they proceeded in natural Order; beginning with Erudition, continuing with polite Learning, and ending with Philosophy. This Order indeed differs from that which Men would follow, when assisted only by the natural Understanding; or when limited to such an Intercourse with others, as we mentioned in the preceding Part of this Preface; where it appears that Man, left to himself, attempts Philosophy before Polite Literature. But after a long Interval of Ignorance, preceded by Ages of Knowledge, the Reproduction of Ideas was necessarily different from their first Generation: as may be illustrated in the following Manner.

The finished Works which the Ancients left behind them, in almost every Kind, had now been forgot for twelve Centuries. The Principles of the Arts and Sciences were buried:

History of Learning.

buried : for though Truth and Beauty seem ever to surround Mankind ; yet we disregard them till they are pointed out to us. Those unhappy Times were not less fruitful than others, in extraordinary Geniuses. Nature is always the same : but what could Geniuses do, dispersed and scattered, as they always are ; employed about different Objects, and left, without mutual Assistance, to the single Lights of their own Minds ? Most Discoveries have been the Fruit of Reading and Conversation : which, like the Air we breathe, without reflecting upon it, supply Life and Vigour. The Men we speak of, had not these Helps ; but like the first Inventors of the Arts, and Sciences, stand eclipsed by their illustrious Successors ; who would have been themselves eclipsed, in like Manner, had they lived first. The original Inventor of the Wheels and Pinions, might, in another Century, have invented Watches : and *Gerbert*, had he lived in the Times of *Archimedes*, might perhaps have rivalled him.

Most of the Geniuses of those dark Ages styled themselves either Poets or Philosophers. It was easy for them to assume a Title which costs so little ; and which Men flatter themselves they principally owe to their own native Light. They thought it superfluous to seek for the Models of Poetry in the dead Languages of the *Greeks* and *Romans* ; and instead of the true Philosophy of the Ancients, they adopted only a barbarous deformed Tradition thereof.

thereof. Their Poetry was only a childish Gingle of Words. And instead of enquiring into Nature, and studying Man, they devoted themselves to frivolous Questions about abstract and metaphysical Essences; which, often requiring too much Subtility, became an Abuse of Genius. Add to this, the State of Slavery in which nearly all *Europe* lay; together with the Ravages of Superstition, at once the Child and Parent of Ignorance; and we shall see that the Restoration of Learning and Taste was then impracticable: for whatever is great must always be owing to a Liberty of Acting and Thinking; which only requires Good-Sense to restrain it. To deliver Mankind from Barbarism, required one of those Revolutions which give a new Face to the World. The Empire of the *Greeks* was destroyed; and its scattered Remains of Knowledge were brought into *Europe*. The Invention of Printing, and the Patronage of the Dukes of *Medicis*, and of *Francis I.* made Science revive, and Light diffuse, in every Quarter.

Languages and History, being necessarily *Erudition* neglected during the Ages of Ignorance, now became the first Study. The Mind, released from Barbarism, acted as in a State of Childhood; and grew eager to collect Ideas: but its Faculties were so benumbed, by long Disuse, as to be rendered incapable of procuring them at once, or in regular Order. Memory therefore was the first Faculty cultivated; as

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being

being the most readily satisfied; and the Knowledge it procures, the most easily retained. These Restorers did not begin, like the first of Mankind, with the Study of Nature; as having Helps at Hand, which the earliest Ages wanted. The Works of the Ancients, by Means of Printing, and the Generosity of the Great, now became common. Hence Learning was to be had by Reading; and it costs less Pains to read Discoveries, than to make them. The Learned adopted, indiscriminately, whatever the Ancients delivered; translated their Works; commented upon them; and, from a Principle of blind Gratitude, revered them, without duly estimating their Value.

Hence proceeded that Swarm of Scholars, so deeply skilled in the learned Languages as to despise their own; who, as a celebrated Writer observes, knew every Thing of the Ancients but their Graces; and prided themselves with the Pomp of Learning. But the Advantages which cost us least, are usually those we the most value in ourselves. There was indeed some Kind of Pretext for this Vanity. Erudition and historical Facts are an immense Treasure; which we seem to increase daily, by Acquisitions made without Pains. On the contrary, the Fund of Science and Philosophy being but small; instead of adding to it, by Dint of Labour, we are often obliged to unlearn what we had got: so that a Scholar, with much less
Merit,

Merit, may easily become more vain than a Philosopher, or even a Poet. An inventive Genius is ever dissatisfied with its own Progress; because it sees much farther than it reaches: and the greatest Minds often find in themselves a secret rigorous Judge, which the Approbation of others may silence for a while, but can never corrupt. We are not, therefore, to wonder that these Scholars should glory so much in their pompous Province; though it often appears ridiculous, thorny, and sometimes barbarous.

The present Age, indeed, appearing designed to alter Laws, and to distribute Justice, judges a little unfavourably of this Set of Gentlemen, formerly famous. It is now become so reputable to slight them, that many content themselves with that single Merit. The present Contempt cast upon Men of Erudition, appears like Punishment for their Pride; or Revenge for the injudicious Applause bestowed upon them by their Contemporaries: as if, by demolishing these Idols, their very Names were to be sunk. But as all Excesses are unjust, let us, with Gratitude, enjoy the Benefits arising from the Labours of these learned Men. To enable us to cull what is useful from the Works of the Ancients, they were obliged to collect Dross along with the purer Metal; and might have separated them as we have done, had they lived later. Erudition therefore was necessary; and paved the Way to Polite Learning.

*Introduces
Polite
Learning.*

But Men cannot long study the Ancients, without discovering that there is something better than Facts and Words to be learned from their Works. The Beauties of these Authors were soon observed: for a bare Hint is sufficient to make Truth be taken Notice of. The Ancients could not be more admired than they had been; but they now began to be admired more justly, though not yet judiciously. They were looked upon as inimitable, otherwise than by servilely copying them. Nor was it thought possible to express any thing well, but in the learned Languages. It was not considered that the studying of Words is a temporary Inconvenience, useful in facilitating the Study of Things; but proving a real Misfortune when it retards Science: and consequently that it was sufficient to have familiarized themselves with the Greek and Latin Authors, and improved by their shining Passages; without pretending to write in their Languages: which is Time and Labour lost, with regard to the Advancement of Knowledge. Neither did these Moderns sufficiently reflect, that if numerous Beauties of Style, in the Ancients, are hid to us; numerous Blemishes are likewise hid, or else mistaken for Beauties; and that all we can expect from a servile Use of the Language of the Ancients, is only the forming of one motly Style, from a Number of different Authors. And though such a Style may appear extremely correct and pleasing to us Moderns;
yet

yet to *Tully* or *Virgil* it must needs have appeared ridiculous. We should laugh at a Work composed of Phrases taken from *Bossuet*, *la Fontaine*, *la Bruyere* and *Racine*; though each of these Authors, separate, is an excellent Model of Writing.

This Prejudice, in these first Men of Erudition, produced, in the sixteenth Century, a Shoal of Latin Poets, Latin Orators and Historians; the principal Merit of whose Works consists too much in the Language, of which we are but incompetent Judges. Some of them resemble our School-Rhetoric Harangues, which are shadowy Things without Substance; and want nothing but translating into *French*, to frighten a Reader.

Men of Learning are, by Degrees, recovered from this Infatuation. Their Cure is probably owing, in Part, to the Encouragement of the Nobility, who would willingly appear learned without Trouble; and be able to judge of Works of Genius without Study; or at most by promising Favours or Friendships to Authors. Men now began to think that beautiful Thoughts lost nothing by being cloathed in a living Language; had the additional Advantage of being intelligible to vulgar Readers; and that it was no Merit to dress ordinary or ridiculous Notions in any Language, especially in such as are ill spoken. Hence the Learned began to improve their own Languages; and tried to express in them what the Ancients had delivered in theirs.

theirs. But in consequence of the former Prejudice, which was so difficult to conquer, instead of enriching the *French Language*, they began to disfigure it. *Ronsard* made a barbarous Jargon of it, interlarded with *Greek* and *Latin*; but he luckily rendered it so unlike itself, as to prevent its becoming ridiculous. Authors soon became sensible, that they ought to transfer the beautiful Thoughts, not the Words, of the ancient Languages into ours: which under the Conduct of good Taste, was soon enriched with numerous happy Turns and Phrases. At length Authors did not confine themselves to copy, or even to imitate, but endeavoured, if possible, to excel the *Greeks* and *Romans*; and think without Restraint. Thus the Imagination of the Moderns was gradually kindled up by that of the Ancients; and produced all the great Performances of the last Century, in Eloquence, History, Poetry, and the different Kinds of Literature, nearly at the same Time.

MALHERBE, trained up in the Study of the excellent Poets of Antiquity, and taking, like them, Nature for his Guide, enriched our Poetry with new Beauties and Harmony. *Balzac*, though at present despised, gave Majesty and Number to our Prose. The Society of *Port Royal* continued what *Balzac* began; and added such Accuracy, such a happy Choice of Terms, and such a Parity, to our Prose, that most of their Works still retain a modern Air, which distin-

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distinguishes them from numerous other Books, written about the same Time, now grown obsolete. *Corneille*, for several Years a Slave to false Taste in his Dramatic Performances, became free at last; and discovered the Laws of the Drama by the Strength of his Genius, more than his Reading. These Laws he has delivered in his admirable Discourses on Tragedy; in his Reflections on each of his Pieces; but principally in the very Pieces themselves. *Racine* struck into a new Track; introduced into Tragedy a Passion scarce known upon the Stage of the Ancients; and unfolded the Doubles of the human Heart, in a Vein of Truth and Elegance joined with Sublimity. *Moliere*, in finely painting the Foibles and Manners of his Age, has greatly excelled the ancient Comedy. *La Fontaine* has eclipsed *Aesop* and *Phaedrus*; and *Bossuet* has rivalled *Demosthenes*.

The Arts of Elegance are so connected with Polite Learning, that a Turn for cultivating the one, leads to improve the other. Whilst Learning flourished in this Manner, *Poussin* produced his Paintings, and *Puget* his Statues; *La Sueur* painted the *Chartreux*; *Le Brun* the Battles of *Alexander*; and *Lulli*, then inventing a Music adapted to our Language, rendered the Poems of *Quinault*, and his own Music, immortal.

Indeed Painting and Sculpture were much quicker restored than Poetry and Music. For

when the various Works of the Ancients now began to be studied, judicious Artists were presently struck with those obvious Master-Pieces of Antiquity which had escaped the Fury of Barbarism. But the Works of *Praxiteles* and *Phidias* could not be otherwise imitated than by exact copying. Hence *Raphael* and *Michael Angelo* soon brought their Art to a Degree of Perfection that hath not since been exceeded.

Painting and Sculpture, falling immediately under the Senses, could not fail of preceding Poetry. The Senses must have been much sooner affected with the palpable, ocular Beauties of the ancient Statues, than the Imagination with the transient, mental Beauties of the ancient Writers. And even when the Imagination had begun to taste these transient Beauties, the Imitation of them must needs prove imperfect; not only on account of Servility, but the being confined to a foreign Language: which are Cramps to the Imagination. If our modern Painters and Sculptors could not have procured the same Materials to work upon, as the Ancients had; but, like our Men of Learning, bestowed much Time in acquiring, or imperfectly imitating, these Materials, without resolving to make use of others, in copying the Works they so much admired; they would doubtless have proceeded much slower, and might not yet have discovered the Materials.

Music

Musick must have arrived much later to any tolerable Degree of Perfection; being an Art which the Moderns were obliged to invent. Time has destroyed all the Models of this Kind, left by the Ancients; at least the Writers that remain only furnish obscure Intimations upon this Subject; or such as rather surprize than instruct us. And hence many of the Learned zealously pretend that the Moderns have carried this Art much farther than the *Greeks*. This Opinion, for Want of Evidence, seems as difficult to support as to confute; and can be but weakly combated from the prodigious Effects, whether fabulous or real, related of the Musick of the Ancients. Perhaps the ancient Musick was entirely different from the modern; as the ancient might excel in Melody, and the modern in Harmony.

It would be unjust, on this Occasion, not to acknowledge the Obligations we have to *Italy*; from whence we received the Sciences now universally spread over *Europe*. It is to *Italy* we principally owe the Polite Arts, and good Taste; of both which the *Italians* have produced numerous inimitable Examples.

Polite Learning, and the Liberal Arts, ap- *Philosophy.*
peared, and flourished, in every Nation much earlier than Philosophy, whose Progress was slow. Not that it is easier to excel in Polite Learning, than in Philosophy: Excellence is equally difficult in both: but reading of the
ancient

Preface by the Editors.

ancient Authors must more readily have contributed to promote Polite Learning, and good Taste, than to advance the natural Sciences. Literary Beauties are presently perceived. Perception precedes Thought; and we judge of our Perceptions before we judge of our Thoughts. The Ancients were incomparably better Writers than Philosophers. In fact, though the first Operations of Reason are prior to the first Efforts of Imagination; yet the Imagination, when once at work, proceeds much faster. It has the Advantage of acting upon Objects of its own Creation; whereas Reasoning, being pinned down to the Objects before it, is obliged to stop at every Step, and often exhausts itself in fruitless Researches. The Universe and Reflection are the primary Book of Philosophers; and the Ancients doubtless studied it. The Moderns were obliged to do the same; for the Ancients could not save them the Labour: most of their Works were lost; and the few that remained, being imperfect, or spoiled by Time, could give but very uncertain and glimmering Notions in so diffusive a Subject as Philosophy.

The Doctrine of the Schoolmen, containing all the pretended Knowledge of the Ages of Ignorance, likewise obstructed the Progress of true Philosophy in its Dawn. The Learned World long thought themselves possessed of *Aristotle's* Philosophy in Purity, though darkened by *Arabian* Commentators, and loaded with absurd or trivial Additions; and

and never examined whether this barbarous Philosophy was really the Work of that great Man: so much Regard they paid to Antiquity. And thus Numbers, confirmed in Error by Education, grew confident of being in the Right, as never suspecting themselves in the Wrong. And hence, whilst numerous Authors wrote in Imitation of the ancient *Greek Poets*, and *Orators*, so as to rival, or, perhaps, excel the Originals; the remaining Scantling of the *Greek Philosophy* was scarce understood.

The numerous Prejudices, raised by a blind Admiration of Antiquity, were farther strengthened by the bad Use which a few Divines, of great Power, ventured to make of the People's Subjection. We would by no Means load the whole venerable learned Body of Divines with an Accusation that only affects some few of its Members. The Poets had been allowed to celebrate the Pagan Deities; whilst the World was justly persuaded that the Mention of such Deities was only Matter of innocent Amusement. The Religion of the Ancients, by supposing all Things animated, opened a large Field to fertile Imaginations; whilst the Principles of that Religion were too absurd to give any Suspicion that *Jupiter* and *Pluto* would again be introduced on the Stage, by any Sect of Innovators. But it was either apprehended, or pretended, that blind Reason might hence wound Christianity. This was indeed apprehending a feeble Attack
upon

upon a Religion sent down from Heaven; a Religion long and justly venerated by the People; a Religion for ever secured by the Promises of God himself. But even suppose a Religion ever so absurd (a Reproach which nothing but Impiety can cast upon the Christian) its Destruction can never proceed from Philosophers; who, when they discover Truth, content themselves with barely shewing it to the World, without forcing Men to receive it; which is impossible. Inspiration instructs, but Enthusiasm deceives. The necessary Restraint of Enthusiasm should not infringe the Liberty requisite to true Philosophy; from whence Religion may receive ample Advantage. For, if Christianity lends the necessary Lights to Philosophy; and if Grace alone can convert Unbelievers; the silencing of Unbelievers belongs to Philosophers; whilst Divines, to secure the Victory of Faith, need only employ the Weapons designed to be turned against it.

But some of these Gentlemen had a still more feeling Interest to oppose the Progress of Philosophy. Having a false Notion that the Faith of the People is best fixed by Variety of Objects; and not being satisfied with the proper Veneration due to the Christian Mysteries; they endeavoured to erect their own private Opinions into Articles of Faith; and grew more anxious for themselves than for Religion. And thus, if Religion had been only the Work of Men, they might have given it

it a dreadful Wound: for their Errors, once becoming known to the undistinguishing Multitude, might easily have been confounded with the Truth.

A Set of more honest, but equally dangerous Divines, joined the former, from different Motives. Though the sole Design of Religion is to regulate our Faith and Manners, these Gentlemen imagined it was also intended to teach us Philosophy, and the System of the World; which God has expressly left open to Man's Enquiry. They did not reflect that the Design of the Scripture, and the Fathers, is to shew the People, as well as Philosophers, what they ought to believe and practise; and that common Language was here employed upon all indifferent Subjects. But Theological Tyranny, or Prejudice, prevailed. A powerful Tribunal was erected in the South of *Europe*, the *Indies*, and *America*; a Tribunal unauthorised by Religion, and unapproved by Charity; a Tribunal whose Name no *Frenchman* could ever pronounce without Horror: this Tribunal condemned a great Astronomer for asserting the Motion of the Earth; and declared him a Heretic: as Pope *Zachary*, some Centuries before, condemned a Bishop, for differing in Opinion from St. *Augustin*, about the Antipodes; and conjecturing their Existence six hundred Years before *Columbus* discovered them. And in this Manner, the Abuse of spiritual Authority, in Alliance with temporal Power, silenced Reason; and almost prohibited Mankind from Thinking.

Whilst

Restoration of
Philosophy,
by

Lord
Bacon.

Whilst ignorant or malevolent Enemies thus made open War with Science, Philosophy retreated under the Covert of some extraordinary Men, who, without entertaining the dangerous Ambition of unveiling the Eyes of their Cotemporaries, prepared, in Shade and Silence, that Light, which afterwards, by insensible Degrees, enlightened the World.

At the Head of these illustrious Heroes we deservedly place the immortal *Francis Bacon*, Lord High-Chancellor of *England*; whose Works, though justly esteemed, are too little known, and deserve Perusal more than Praise. To consider the just and extensive Views of this prodigious Man; the Multiplicity of his Objects; the Strength of his Style; his sublime Imagery; and extreme Exactness; we are tempted to esteem him the greatest, the most universal, and most eloquent of all Philosophers. *Bacon*, born in a Time of gross Ignorance, became immediately sensible that no true Philosophy then existed; though many undoubtedly thought they excelled in it: for the more ignorant the Age, the more confident it is of possessing all attainable Knowledge. *Bacon* began with a general Review of all the Objects of Natural Knowledge. He divided the Sciences into different Branches, and made the most exact Enumeration of them; he examined what was at that Time known upon each; and drew up an immense Catalogue of such as yet remained to be discovered. This

is

is the Design of his admirable Work, *de Augmentis Scientiarum*. In his *Novum Organum Scientiarum*, he dilates and improves his former Views; and amply shews the Necessity of introducing an Experimental Philosophy, which was never thought of before. Detesting all Systems, he considers Philosophy as a Science that makes us wiser and happier; confines it to the Knowledge of what is useful; and repeatedly recommends the Study of Nature. All his other philosophical Works are formed upon the same Plan; and to their very Titles bespeak the Man of Genius, and extensive View. He therein collects Facts; compares Experiments, points out many to be tried; and invites Men of Learning to cultivate and improve the Arts, which he esteems the most noble and most essential Part of Knowledge. He communicates, with a noble Simplicity, his *Thoughts and Conjectures* upon the different Objects that merit Mens Attention; and might have said, with the humane Character in *Terence*, *Nil humani à me alienum*. "I disregard nothing that belongs to Man." Natural Philosophy, Morality, Civil-Policy, and Oeconomics, appear to have been all perfectly understood by this sagacious, penetrating Genius: so that one knows not which to admire the most in him, the Richness he gives to all the Subjects he treats of, or the Dignity wherewith he treats them. His

Writings

Writings in Philosophy may be compared to those of *Hippocrates* in Physic; and would be no less admired and studied, if Mankind were as solicitous to improve their Understanding, as to preserve their Health.

Founders of Sects suddenly heat the Brain of Mankind. *Bacon* had no Design of forming a Sect; the Nature of his Philosophy forbade it: a Philosophy too grave and solid to raise Enthusiasm. The Doctrine of the Schoolmen, prevalent in his Time, could not be demolished without new and daring Opinions: but how should this Philosopher raise an inordinate Reputation among his Contemporaries, by only shewing them "how little they knew, and how much remained to be known?"

We might here possibly tax the great Chancellor with a little Timidity, were we not sensible with what Deference, and even Veneration, so sublime a Genius deserves to be judged of. For though he acknowledges that the Schoolmen enervated the Sciences with minute and trifling Questions; and that the Mind should give up the Study of Generals for that of Particulars; yet by his frequent Use of Scholastic Terms, sometimes of Scholastic Principles, and the then fashionable Divisions and Subdivisions, he seems to have shewn too much Deference to the prevailing Taste of the Age he lived in. And hence this very great Man, after breaking so many Shackles, was still bound with some, which he

he either could not throw off, or would not venture to break.

It is to this great Author we are chiefly indebted for our Encyclopædiac Plan, above-mentioned. We have often made this Acknowledgement, and now repeat it, and will never neglect an Opportunity of repeating it. We did not, however, think proper to copy our Master minutely in every Point. If we have not followed his Example, and classed the Reasoning Faculty after the Imagination, it was because in our System we observed the Metaphysical Order of the Mind's Operations, rather than the historical Order of its Progress since the Restoration of Learning: which latter Order the illustrious Chancellor had in View, when he formed his Plan of the Sciences. So that, *Bacon's* Design being different from ours, and the Sciences having been greatly improved since his Time, it is no Wonder if we sometimes take a different Method.

Besides the Alterations made in the Order of our general Distribution, for which we have already assigned our Reasons; we have in some Instances carried the Divisions farther, especially in that Part which regards Mathematics and particular Physics: but, on the other Hand, have not minutely pursued the Division of certain Sciences, which he carries down to their ultimate Branches. These Branches must be taken proper Notice of in the Body of our Work; and would have only

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served,

served, in the Table, to embarrass the general Scheme. Immediately after our Encyclopædic Plan, the Reader will find that of this *English* Philosopher: which Disposition we chose as the easiest and shortest Way of distinguishing what is ours, from what we have borrowed from him.

The great Chancellor *Bacon* was succeeded
Des Cartes. by the illustrious *Des Cartes*. This extraordinary Man, whose Fate has varied so much in less than a Century, had all the necessary Qualifications for changing the Face of Philosophy. He had a lively Imagination, strong Reason, great Knowledge of his own acquiring, rather than derived from Books; an Intrepidity to oppose prevailing Prejudices; and such an Independency as did not oblige him to dissemble. Accordingly he experienced, in his Life-time, what commonly happens to those who visibly assume an Ascendant over others. He made several Enthusiasts, and had many Enemies. Either from knowing, or distrusting, his own Nation, he retired to a free Country, that he might study unmolested: but though he less endeavoured to make Followers, than to deserve them, Persecution followed him to his Retirement. Notwithstanding all the Sagacity he employed to prove a God, he was accused of denying his Existence, by Christian Pastors who possibly did not believe one themselves. Being thus persecuted and reviled by Foreigners, and but ill treated at home, he went to end
his

his Days in *Sweden*; and doubtless never suspected the violent Run which his Opinions were for a Time to have in the World.

Des Cartes may be considered both as a Geometrician, and Philosopher. Mathematics, which he rather appeared to slight, at present make the most solid and indisputable Part of his Glory. Algebra, an Art chiefly invented by the *Italians*, and greatly improved by our illustrious *Pieta*, made new Acquisitions in the Hand of *Des Cartes*: one of the most considerable whereof is his *Method of Indeterminates*; an ingenious, subtle Artifice, since employed in many Enquiries. But what most contributed to immortalize this great Man, is his Application of Algebra to Geometry; which is one of the most extensive happy Thoughts that ever entered the Mind of Man; and will always prove a Key in the deep Researches, not only of the sublimer Geometry, but of all the Physico-Mathematical Sciences.

Perhaps he was equally great, though not equally successful, as a Philosopher. Geometry, which, by the Nature of its Object, must always improve without diminishing, could not fail, in such a masterly Hand, of making a very sensible Progress; which was manifest to all the World. Philosophy was at that Time in a very indifferent State; every Part of it was to be begun anew: and in every Science the first Beginnings are difficult. The Merit of beginning is more than of improving. If

Des Cartes opened the Road to us, without pursuing it himself so far as his Followers imagine; yet the Sciences are more indebted to him than his Adversaries allow. His *Method* alone was sufficient to render him immortal; his *Dioptrics* were the greatest and most beautiful Application of Geometry to Natural Philosophy that had ever till then been made; and in all his Works, even those that are the least read at present, there shines the masterly Genius of an Inventor. To judge, without Partiality, of his Vortices, now almost become ridiculous, scarce any thing better could have been imagined at that Time. The Astronomical Observations which have since destroyed them, were then either imperfect, or ill ascertained. Nothing was more natural than to suppose that a Fluid carried the Planets round their Orbits. It required a long Series of Phænomena, Calculation, and Reasoning, and consequently a Number of Years, to demolish such an enchanting Theory: which had also the singular Advantage of accounting for the Gravitation of Bodies, by the centrifugal Force of the Vortex itself. And perhaps this Theory of Gravity is one of the most beautiful and ingenious Hypotheses that was ever invented; insomuch that Philosophers would never have given it up, if not obliged thereto by the new Theory of central Forces, and a Set of Experiments but lately made. We must therefore acknowledge that *Des*
Cartes

Cartes, being under a Necessity of creating a Natural Philosophy entirely new, could scarce have created a better; that Philosophy was obliged to pass through Vortices before it arrived at the true System of the World; and that if *Des Cartes* was mistaken in the Laws of Motion, he was, however, the first Man who suspected there were any.

His Metaphysics, as ingenious and as new as his Natural Philosophy, had nearly the same Success; and may be justified by nearly the same Reasons. But such is the Fate of this great Man, that after having had Followers without Number, he at present rarely finds a Defender. He was doubtless mistaken in allowing innate Ideas: but had he retained the only Truth delivered by the Peripatetics, *viz.* that Ideas arise from the Senses, perhaps, the numerous Peripatetical Errors, in whose Company this Truth lay disgraced, could not have been easily eradicated. *Des Cartes* courageously ventured to shew Men of Genius how they might shake off the Yoke of the Schools, the Tyranny of Opinion, Authority, Prejudice, and Barbarism; and by beginning the Work, of which we now receive the Benefit, he hath, perhaps, done Philosophy a more difficult and signal Service, than all his illustrious Successors. He may be considered as the Head of a Party, or a Leader, who had the Courage to stand up first against Arbitrary Power; and by projecting a glorious Revolution, laid the Foundation of a just and happy

Government, which he could not live to see established. If he left off with a Notion that he had explained all Things; he began with doubting of every Thing: and the Weapons we use against him, were first his own. Indeed, when absurd Opinions become inveterate, we must, in order to undeceive Mankind, set up other Absurdities in their Stead; when nothing better is to be done. The Instability, or Vanity, of Mens Minds is such, that they must always have some Opinion to fix on. Men are but like Children, and must have a Rattle before they will part with a dangerous Weapon. They will throw aside the Rattle when they come to the Use of Reason. By thus deceiving Philosophers, or those who think themselves such, we at least teach them to distrust their own Understanding: and this Disposition is the first Step towards Truth. For Want of this Distrust, *Des Cartes* was persecuted in his Life-time, as if he had come to persecute Mankind.

*Sir Isaac
Newton.*

At length appeared *Sir Isaac Newton*, who, having the Way paved for him by *Huyghens*, gave Philosophy such a Form as is likely to last. This great Genius saw it was Time to banish all vague Hypotheses, and Conjectures, out of Natural Philosophy; or to lay no Stress upon them; and that this Science should be entirely subject to Experiment, and Geometry. With this View, perhaps, it was that he began by inventing the Method of Fluxions, and
infinite

infinite Series, which are of extensive Use in Geometry; but of greater still in determining the complicated Effects of Nature, where every Thing seems to be performed by Kinds of infinite Progressions. The Experiments made upon Gravitation, and the Observations of *Kepler*, led *Sir Isaac Newton* to discover the Force which retains the Planets in their Orbits. He at once shewed us how to distinguish the Causes of their Motions, and to calculate them, with an Exactness scarce to have been expected from the joint Labour of Ages. He discovered a System of Optics entirely new; and shewed Mankind the Nature of Light by analysing it. All we can add in Praise of this great Philosopher, would come far short of the universal Testimony at this Day given to his numerous Discoveries; and to his Genius, which was, at once, extensive, penetrating, and exact. For enriching Philosophy with numerous real Acquisitions, he doubtless merits our highest Acknowledgements; particularly for teaching us Caution, so as to keep Philosophy within just Bounds, and check that Sort of Philosophical Presumption, which Circumstances forced upon *Des Cartes*. *Newton's* Theory of the World is now so generally received, that some would fain dispute him the Honour of the Discovery: but it is an usual Thing to begin with charging Error upon great Men, and to end with calling them Plagiaries.

Preface by the Editors.

We leave to those who find every Thing in the Ancients, the Pleasure of discovering, in their Works, the Gravitation of the Planets, though it should not happen to be there : but, supposing the *Greeks* had some Notion of it, what was in them but a wild precarious Guess, is a Demonstration in the Hands of *Newton*. In this very Demonstration, which is entirely his own, consists the real Merit of his Discovery : and the Doctrine of Attraction, without this Support, would be but a mere Hypothesis. If any celebrated Author should, at present, think fit to foretel, without Proof, that the Art of making Gold will some Time or other be discovered ; would Posterity hence have any Right to deprive the Chemist of his Glory who should verify this Prediction ? And would the Discovery of the Telescope be less the Property of its Inventor, because some of the Ancients might have thought it possible to extend the Limits of Sight ?

Others among the Learned think it a more just Accusation of Sir *Isaac Newton*, that he brings back into Philosophy the *occult Qualities* of the ancient Philosophers and Schoolmen. But are these learned Gentlemen certain that the Words *occult Qualities*, which had no Meaning in the Mouths of the Schoolmen, and were used by them to denote an Existence, of which they imagined they had some Idea, were not intended by the ancient Philosophers, as a modest Confession of their Ignorance ?

Ignorance? *Newton*, who studied Nature, did not pretend to know any more than they of the first Cause of Phænomena; but avoided using the same Expression, for fear of shocking his Cotemporaries, who would have understood him in a different Sense. He satisfied himself with proving that the Vortices of *Des Cartes* could not account for the Motions of the Planets; that the Phænomena and Laws of Mechanics jointly conspired to destroy them; and that there is a Force by which the Planets tend towards one another, the Principle, or Cause, whereof remains entirely unknown to us. He does not reject the Word Impulsion; but wishes it may be used more successfully than before, to account for the Motions of the Planets. His Wish has not hitherto been accomplished; and possibly it may be long before it is. But where is the Injury done to Philosophy, by *Newton's* leaving us Room to think that Matter may have Properties we do not perceive; and checking our ridiculous Pretension to know them all?

Metaphysics were not entirely neglected by *Newton*. He was too great a Philosopher not to be sensible that this Science is the Foundation of all our Knowledge; and that it is hence alone we must derive precise and accurate Notions of Things. It appears from the Works of this great Geometrician, that he actually had such abstract Notions of the principal Objects of his Attention.

tention. But, whether he was not satisfied with his own Progress in Metaphysics; or thought it a Matter of Difficulty to give Mankind satisfactory or extensive Notions in a Science too often rendered uncertain, and disputatious; or whether he apprehended that, under the Sanction of his Name, his Metaphysics might, like those of *Des Cartes*, be perverted to support false or dangerous Opinions; he has scarce ever mentioned them in his published Works; so that we are at a Loss to know his Sentiments upon the different Objects of this Science; except from what we find in the Works of his Followers. As he did not therefore produce any Revolution in Metaphysics, we forbear considering him as a Metaphysician.

What *Newton* would not attempt, and perhaps could not have executed, *Locke* undertook, and successfully performed. He may be said to have invented Metaphysics, as *Newton* invented Physics. He judged that the Abstractions, and ridiculous Questions controverted before his Time, and mistaken for the Substance of Philosophy, were the principal Part to be rejected. He examined into these Abstractions, and the Abuse of Words, and found them the primary Causes of our Errors. To discover the Nature of the Soul, its Ideas and Affections, he did not study Books, because they would have misled him; but entered deep into himself; and after having surveyed and considered what he there experienced, presented

presented the Public with his *Essay on human Understanding*, as the Glass wherein he had viewed himself. And thus he reduced Metaphysics to what, in Reality, they ought to be, an Experimental Philosophy of the Soul; a Philosophy very different from that of Bodies, both with regard to its Object, and the Manner of considering it. In Physics we often discover Phænomena unknown before: but in Metaphysics, Facts as old as the World, equally exist in every Man; to the Mortification of those who think they can here discover any thing new. Rational Metaphysics, like Natural Philosophy, consists in carefully collecting Facts, reducing them into a Body, explaining them by one another, and distinguishing those that ought to precede, and serve as a Basis to the rest. In short, the Principles of Metaphysics, being as simple as Axioms, are equally found in Philosophers and the Vulgar. But the slow Progress of this Science shews how seldom these Principles are successfully applied; either on Account of Difficulty in their Application, or because the natural Impatience of Mankind will not easily permit the necessary Restraint. Yet the Titles of Metaphysician, and great Metaphysician, are very common; for we love exaggerating: but how few truly deserve the Name? How many have no better Claim to it, than what arises from an unhappy Talent of subtly obscuring the clearest Ideas; and of preferring the Marvellous to Truth,
which

which is always plain and simple? And hence we need not wonder, if many of those called Metaphysicians have a mutual Contempt for each other. Possibly the Word Metaphysician will soon be treated as the *Greeks* treated the Term Sophist; which though it signifies a wise Man, yet, being discredited by those who bore it, was rejected by real Philosophers. From this History we may infer that *England* owes to us the Origin of that Philosophy which we have received from thence. Perhaps substantial Forms are further removed from Vortices, than Vortices are from Gravitation; as pure Algebra, and the Application of it to Geometry, seem farther asunder than *Barrow's* minute Triangle, and the Method of Fluxions.

Thus we have mentioned the principal Geniuses, which the human Mind should consider as its Leaders; and to whom ancient *Greece* would have erected Statues, though, to make room for them, even those of Conquerors had been displaced.

*Other
modern
Inventors.*

The Limits of this Discourse prevent our mentioning many other illustrious Philosophers, who, without having the extensive Views of the preceding, yet, by their Labours, greatly contributed, in their Turn, to advance the Sciences; and raised some Corner of the Veil that concealed the Truth. Of this Number are, *Galileo*, to whom Geometry is greatly indebted for his Astronomical Discoveries, and Mechanics for his Theory of Acceleration;

tion; *Harvey*, rendered immortal by discovering the Circulation of the Blood; *Huyghens*, whom we mentioned before, as preparing the Way for *Newton*, and who, by numerous Works of Reasoning and Genius, has deserved so well of Geometry and Natural Philosophy; *Pascal*, Author of a Treatise on the Cycloid, which shews a prodigious Sagacity and Penetration, and of a Treatise of the Equilibrium of Fluids, and the Gravity of the Air, wherein a new Science is opened by his universal and exalted Genius; and the Loss of whose Talents in Philosophy, could not be sufficiently regretted, if Religion had not reaped the Advantage; *Malbranche*, who so well unravelled the Errors of the Senses, and saw into those of the Imagination, as clearly as if he had not been misled by it; *Boyle*, the Father of Experimenal Philosophy; and numberless others, among whom we should mention, with Distinction, *Vesalius*, *Sydenham*, *Boerhave*; with a long List of celebrated Anatomists and Physicians.

Among these great Men, there is one, whose *Leibnitz*. Philosophy at present is so much received, and so much opposed, in the North of *Europe*, as obliges us more particularly to mention him, viz. the illustrious *Leibnitz*; who, had he nothing to recommend him besides the Glory, or even Suspicion, of sharing the Invention of Fluxions with Sir *Isaac Newton*, would deserve to be mentioned with Honour. But we chuse to consider him principally as a Metaphysician.

physician. He appears, like *Des Cartes*, to have been sensible that all the pretended Solutions of the subtle Questions about the Union of the Soul and Body, Providence, and the Nature of Matter, were still insufficient; and had the Advantage of setting all the Difficulties relating to these Questions in a very clear Light; but, instead of using the Caution of *Locke* and *Newton*, and contenting himself with suggesting Doubts and Queries, he attempted to give Solutions: and here perhaps he has had no better Success than *Des Cartes*. His Principle of a *sufficient Reason* for every Thing, however beautiful and true in itself, is not likely to prove very serviceable to us, who are so little acquainted with the primary Reasons of Things. His *Monades* shew that he sufficiently felt the Difficulty of forming a precise Idea of Matter; but these *Monades* seem incapable of giving one. His *Pre-established Harmony* appears to have only added one Difficulty more to the Opinion of *Des Cartes*, about the Union of Soul and Body; and his System of *Optimism*, or every Thing being the best that is possible, appears dangerous, as it pretends to account for all Things.

Reception
of the
Baconian
and New-
tonian Phi-
losophy.

The following Observation will not surprise Philosophers. The great Geniuses before-mentioned produced no extraordinary Alteration in the Sciences, during their Life-time. We have already seen why *Bacon* was not at the Head of a Sect: but two farther Reasons may be added. This very great Man wrote most of
his

his Works in a Retirement, to which his Enemies had forced him: and the Violence done to the Statesman could not fail of wounding him as an Author. Again, as he now entirely gave himself up to useful Studies, perhaps he grasped so many Subjects, that his Cotemporaries could not at once comprehend them. We scarce can allow the greatest Geniuses to have so diffusive a Knowledge as his; but are more inclinable to learn something of them, in a narrower Sphere; without obliging ourselves to reform our whole System of Notions according to their Model. And hence the Works of *Des Cartes* suffered a stronger Persecution in *France* after his Death, than the Author sustained, in *Holland*, during his Life-time. It was with great Difficulty that the Schools, at last, ventured to receive a Philosophy, which they supposed contradictory to that of *Moses*. *Newton*, indeed, met with less Opposition from his Cotemporaries. Perhaps his Geometrical Discoveries, with which he set out, and of which no Body could dispute with him either the Truth, or the Property, gradually accustomed his Nation to admire him; and pay him such Honours, as neither came quick, nor were rashly bestowed. Perhaps also the Superiority of his Genius might silence Envy: or possibly, though it seems hard to believe, he lived in a Country less ungrateful to Merit than others. Be that as it will, he enjoyed the singular Satisfaction of living to see his Philosophy

losophy generally received in *England*; and of having all his Countrymen for his Followers and Admirers.

But the rest of *Europe* did not at that Time receive his Works with the same Applause. They were so far from being known in *France*, that the Scholastic Philosophy still prevailed with us. *Newton* had demolished the Philosophy of *Des Cartes*, and destroyed his Vortices, before we thought of admitting them. We were as long in supporting, as we were in receiving the *Cartesian* Philosophy: and what appears surprising, our philosophical Writings shew that it is not above twenty Years since *France* began to renounce Cartesianism. The first among us who ventured publicly to declare himself a *Newtonian*, is the Author of the *Treatise Sur la Figure des Astres*; who, besides an extensive Knowledge in the Geometrical Sciences, possesses the true Philosophical Spirit, so rarely found in Geometricians; and such a Talent of Writing, as renders Geometrical Subjects entertaining. *Mr. de Maupertuis* thought it possible to be a good Subject, without blindly adopting the Philosophy of his Country; and has shewn a most laudable Courage in boldly attacking that Philosophy. In Truth, our Nation has a particular Fondness for Novelties, in Matters of Taste; but is extremely attached to old Opinions, in Matters of Science. These two Dispositions, so opposite in Appearance, arise from several Causes, but principally from that

that Ardour of Enjoyment, which seems to constitute our National Character. Whatever is of the sentimental Kind, must be obvious to us; and ceases to be agreeable if it does not strike us at once: but the Ardour, with which we give into it, presently cools; and we grow disgusted as soon as gratified; then fly to a new Object, and presently quit it as soon. On the other Hand, when we attain to Possession, after long Meditation and Pursuit, we would make the Enjoyment as lasting as the Pursuit; and this especially with regard to any conjectural Philosophy, which is much easier attained than exact Calculations. And hence Philosophers are attached to their Theories, with the same Zeal, and from the same Motives, as an Artist is to his Trade. We may pay the proper Regard to *Des Cartes*; yet readily renounce Opinions which he would have renounced, had he lived a Century later. Let us not confound his Cause with that of his Followers. The Genius he shewed, by striking out a new, though mistaken Road, in the Dark, was his own. His first Followers, indeed, gave a Proof of their Courage; but there is no Honour in following him now, when Day-light has discovered his Errors. Among the few Learned who still defend his Doctrine, he himself would have disowned those who rank on his Side, from a servile Attachment to what they learnt in their Infancy; or

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received from National Prejudice; which is a Disgrace to Philosophy. Such Motives may still make lagging Followers; who would not have had the Merit of appearing among the foremost. Those alone can justly admire the Errors of a great Genius, who know how to acknowledge them when discovered. And hence young Men, though commonly thought bad Judges, are perhaps the best in Philosophy; provided they have the proper Lights: because all Things being new to them, they have no other Concern but to make a right Choice.

In Fact, the young Geometricians in France, and abroad, determined the Fate of these two Systems of Philosophy. The old one is now so far exploded, that its most zealous Defenders dare not name the Word *Vortices*, till of late so frequently found in all philosophical Writings. Should Newton's System, by just or unjust Means, happen to be dethroned in our Time, his numerous Followers would doubtless act the same Part they have occasioned others to act before them. Such is the Nature of Mens Minds; such the Effects of Self-love, which actuates Philosophers at least as much as others; and such the Nature of Opposition, which all new Discoveries, whether real or apparent, must unavoidably meet with.

Locke

Locke shared nearly the same Fate with *Bacon*, *Des Cartes*, and *Newton*. He has been long neglected for *Robault* and *Regis*; and is yet but little known to the Generality: he begins however at last to find Readers, and some Admirers, among us. And thus it is that illustrious Writers, often rising too high above their Cotemporaries, are lost to their own Age, and leave Posterity to reap the Fruit of their Labours. The Restorers of the Sciences seldom acquire their full Share of Reputation; whilst Men of a much inferior Order enjoy it. Great Men devote themselves to their Geniuses; but ordinary Writers to the Taste of their Country. Indeed the Consciousness of Superiority is a sufficient Compensation for the Loss of popular Applause. This Consciousness is fed by its own Substance; whilst that Reputation, which the World is so fond of, serves chiefly to comfort those who have not the Advantage of superior Talents. Fame rather proclaims what she hears, than what she sees; and the Poets, who have given her a Thousand Tongues, ought to have veiled her Eyes.

Philosophy, being the prevailing Taste of our Age, seems, by the Progress it makes among us, determined to recover the Time it has lost; and revenge the Contempt it has suffered. The like Contempt now falls upon Learning; and is not the juster for having changed its Object. We may fancy we have selected from the Works of the Ancients all

that it is essential for us to know ; and that it is needless to consult them farther. We seem to consider Antiquity as an Oracle, that has told us all it can ; and regard the restoring of a true Reading, no more than the discovering a new Fibre in the Body. But as it would be ridiculous to think no farther Discoveries can be made in Anatomy, because Anatomists are sometimes employed in such as may be useless in Appearance, though useful in Reality ; it is no less absurd to condemn Learning, on Account of the slender Enquiries in which the Learned are sometimes engaged. It is Ignorance, or Presumption, to pretend that the Whole of any Subject is known ; or that no farther Advantages can arise from studying the Ancients.

Our present Custom of writing every Thing in *French*, doubtless contributes to strengthen this Prejudice ; and is perhaps of worse Consequence than the Prejudice itself. Our Language having spread itself over *Europe*, we now think proper to use it instead of *Latin* ; which, since the Revival of Letters, was the Language of the Learned. A Philosopher indeed is much more excusable for writing in *French*, than a *Frenchman* for writing in *Latin* Verse. The present Custom, however, may have contributed to spread Knowledge, or render it more general ; but can Knowledge be improved by enlarging its Surface ? There hence arises an Inconvenience which should have been prevented.

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The Learned of other Nations, to whom we set the Example, justly thought they could write better in their own Language, than in ours. *England* followed us; *Germany*, where *Latin* seemed to have taken Refuge, begins to lose the Use of it: and doubtless will soon be followed by the *Swedes*, the *Danes*, and the *Russians*; so that, before the End of the eighteenth Century, a Philosopher, who would be thoroughly acquainted with the Discoveries of his Predecessors, will be obliged to load his Memory with seven or eight different Languages; and after having spent the most valuable Part of his Life in this Drudgery, must die before he begins his principal Study. The Use of *Latin*, which we have shewn to be ridiculous in Works of Taste, is extremely useful in Philosophy; where Style has no Merit, but that of being clear and distinct: which only requires a Language universally known and allowed. It is therefore to be wished, that the Use of this Language were revived: but there is little Reason to expect it. The Abuse we complain of, favours Vanity and Indolence too much to be remedied. Philosophers, like other Writers, aim at being read; especially by their Countrymen. If they used a Language less understood at Home, they would have fewer Readers to sound their Praise in their own Ears. Indeed though they would have fewer Admirers, they would thus have better Judges: but this is a small Advantage, whilst Reputation arises

more from Number, than the Judgment of Applauders.

It must in Justice be acknowledged that, to compensate this Disadvantage, our own *French* Books of Science have a Kind of Advantage, which till of late seemed peculiar to the Polite Arts. An illustrious Author, whom the present Age has still the Happiness to enjoy, (and whose various Works we should mention with Honour, were we not here obliged to consider him only as a Philosopher) has taught the Learned to shake off the Yoke of Pedantry. He excels in the Art of conveying the most abstracted Ideas intelligibly; and has, by Means of an excellent Method, joined with distinct and clear Expression, levelled them to an ordinary Capacity. He has bestowed such Ornaments upon Philosophy as appeared foreign to her Nature: and this happy Boldness is justified by the most universal, and most pleasing Success. But, like other Original Writers, he has no genuine Successor, though many Imitators.

The Author of the late *Natural History* takes a different Course. After the Model of *Plato* and *Lucretius*, he has embellished his Work, now daily rising in Reputation, with a Majesty and Sublimity of Style suitable to philosophical Subjects, and his own great Genius.

Our Philosophy, however, while it studies to please, seems sensible that its principal End is Instruction: and hence the systematical Spirit in Writing, which is more suited

to flatter the Imagination than improve the Understanding, is at present dropt by the best of our Authors. One of our First-Rate Philosophers seems to have demolished it, in his Treatise of Systems*. Fondness for Hypothesis and Conjecture may have been useful, and even necessary, to the Revival of Philosophy; because the Point was not then so much to think justly, as how to think at all: but Times are altered, and a Writer would now come too late with a Panegyric upon Systems. The Advantage to be reaped from this Humour, at present, is too slender to balance the Inconveniences that attend it: and whoever pretends to prove the Usefulness of Systems from the few Discoveries made by their Means, might as well advise our Geometricians to attempt squaring the Circle; because such Attempts have accidentally discovered some Truths. The systematical Spirit in Natural Philosophy, is like Metaphysics in Geometry; for though sometimes it may be found necessary in discovering Truth, yet singly it is incapable of putting us in Possession thereof. When directed by Observation, it may conjecture the Causes of Phenomena; but Calculation alone can ascertain their Existence; by determining the precise Effects these Causes are capable of producing; and by comparing such Effects with those we find in Experience. Mere Hypothesis, without such Assistance, rarely affords

* M, l'Abbé de Condillac de l'Académie royale de Prusse.

that Degree of Certainty which should ever be sought for in Natural Philosophy; and is seldom found in those trivial Conjectures that pass under the Title of Systems. If no Systems but of this Kind could possibly be had, the principal Excellence of a Philosopher would be the having a systematical Spirit, without ever making a System. And as to the raising of Systems in other Sciences, Experience has furnished a thousand Proofs of its Danger.

Natural Philosophy is entirely limited to Observation and Calculation; Physic to the History of the human Body, its Diseases and their Cures; Natural History to the particular Description of Vegetables, Animals and Minerals; Chemistry to the experimental Composition and Resolution of Bodies; and all the Sciences are, as much as possible, founded on Facts, and Consequences justly deducted therefrom; without leaving any Thing to Opinion, where it can be avoided. Geometry, Astronomy, and Mechanics, are here omitted; as Sciences destined by their own Nature to be always advancing towards Perfection.

The best Things may be abused. The philosophical Spirit, at present in Fashion, of proving every Thing, and taking nothing upon Trust, diffuses itself even to polite Literature, and visibly hinders its Progress. The reigning Passion for analysing and combining, introduces cold lifeless logical Distinctions even in Subjects of Wit and Humour. Indeed

deed Taste and the Passions have their own peculiar Logic, whose Principles are extremely different from those of the common Logic: Principles which we must discover within ourselves; and is a Work not suited to vulgar Philosophy, which considers only the quiet and undisturbed Perceptions of the Soul; where it finds the Differences much more easy to understand, than those of our Passions, or the lively Sentiments that affect us; which are extremely difficult to analyse justly: for we must give ourselves up to them, in order to know them; and whilst the Mind remains affected by them, it is the least qualified to study them. We must, however, acknowledge that this Spirit of Discussion has helped to cure our Learned of their blind Admiration of the Ancients; and taught us to value their Writings for such Beauties only, as we should be obliged to admire even in a Modern. But perhaps we hence derive the strange Metaphysics of the Heart, which have taken Possession of our Stage; and ought to be banished from thence, or at least not suffered to reign. This anatomising of the Soul has crept even into our Circles; where, instead of conversing, we hear Dissertations: so that our Assemblies have lost their principal Charms, their Fire, and their Life.

No Wonder therefore, if our Works of Genius, in general, prove inferior to those of the last Age; since we may find a Cause for it in the very Efforts we use to excel them.

them. Taste, and the Art of Writing, make a quick Progress, when once the true Road is opened. A great Genius no sooner perceives the Beautiful, but he discovers its full Scope. The Imitation of beautiful Nature seems so limited, that a Generation or two come to the Extent of it; and leave nothing for Posterity but copying. This indeed does not satisfy; Riches in Possession increase the Desire of more; and we fall short by endeavouring to stretch farther. The present Age abounds with more Rules, more Light, and more good Judges, yet produces fewer good Books than the last. It is not the present Phrase to say, a Book is good, but that the Author has Wit. The Age of *Demetrius Phalerius* immediately succeeded to that of *Demosthenes*; the Age of *Lucian* and *Seneca* to that of *Tully* and *Virgil*; and ours succeeds to that of *Lewis* the Fourteenth.

We speak of the Age in general, and by no Means intend any Satire upon the excellent Authors of our own Times. The Constitution of the literary World, as well as the natural, has its necessary Revolutions; of which it would be as unreasonable to complain, as of the Change of the Seasons. We are obliged to the Age of *Pliny* for the admirable Works of *Quintilian* and *Tacitus*; which perhaps the preceding Age could not have produced: and ours will leave some glorious Monuments to Posterity. A Poet, famous for his Genius and Misfortunes, has not only
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excell'd *Malherbe* in Ode, but *Marot* in Epigram and Epistolary Writing. Our Age has produced the only Epic Poem, which France may oppose to those of *Greece*, *Rome*, *Italy*, *Spain*, and *England*. Our Nation seems divided betwixt two Authors, who now dispute the Glory of the Buskin: Posterity will fix their Places. We see their Tragedies with extreme Delight, even after *Corneille* and *Racine*. One of them, to whom we owe the *Henriade*, is sure of obtaining a distinguished Seat among the very few Poets of the first Order. He has this almost peculiar to himself, that he excels in Prose as well as Verse. No Writer ever better understood the uncommon Art of denoting every Idea by the most proper and familiar Term. He embellishes his Works, without ever mistaking the Colouring: and has the happy Talent, never to rise above, or sink below his Subject. His Essay upon the Reign of *Lewis XIV.* is the more extraordinary, as he had no Model of this Kind to follow, either ancient or modern. His History of *Charles XII.* from its Rapidity and Majesty of Style, suits the Hero he draws. His lesser Pieces are superior to any of the Kind; and for their Number and Merit might have rendered several Authors immortal. But we cannot here pay this extraordinary Genius the Tribute of Praise he deserves, by enumerating all his admirable Works. It has often been paid him by his Countrymen, by Foreigners, and even by his Enemies,

mies. Posterity will seal it, when he can no longer enjoy it.

But these are not all our Riches. A judicious Writer, as true a Subject as a great Philosopher, has published a Work upon the Principles of Laws; decried by a few in *France*, but esteemed all over *Europe*. Some able Hands have given an Account of this Work; and Men of Penetration understand it. Comedy has acquired an additional Species among us; which it would be wrong to reject, because it gives us a new Pleasure: though this Species of Comedy was not so much unknown to the Ancients as some would persuade us. In short, we have numerous Romances, which prevent our admiring those of the last Age.

The Liberal Arts flourish no less in our Nation. Competent Judges assure us that our School of Painting is the first in *Europe*; and that many Performances of our Sculptors might have been owned by the Ancients. But of all the Polite Arts, Music perhaps has, for these last fifteen Years, made the greatest Progress among us. Thanks to the Labours of a strong, enterprising, fruitful Genius, Foreigners, who could not formerly bear our Concerts, begin to relish them: and *France* appears at last convinced that *Lulli* did not exhaust his Subject. Mr. *Rameau*, by carrying the Practice of this Art to great Perfection, is at once become the Object of Jealousy and Imitation to numerous Artists, who depreciate his Talents, which they strive to rival. But
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his distinguishing Character is the having successfully studied the Theory of Music; discovered the Principle of Harmony and Melody, in the Thorough-Bass; and by this Means reduced the Art to more certain and simple Laws, which before was subject to arbitrary Rules, or such only as blind Experience dictated. We gladly embrace an Opportunity of doing Justice to this Philosophical Artist, in a Discourse principally wrote from Gratitude to Men of Genius. His Merit has forced Acknowledgement from the present Age, but will not be fully known till Time shall have silenced Envy. His Name, which is dear to the most discerning Part of our Nation, can here give no Offence. But should it displease any, it would be hard upon a Philosopher, if he were not allowed to speak the Truth in a Subject of Taste and Science.

Such is the Stock we possess: but what an Idea must be formed of our literary Treasures, when we add to the Works of so many great Men, the Labours of our learned Societies, which are designed to support the Taste for Science and Literature, and have published so many excellent Books! Such Societies cannot fail of procuring great Advantage to a State, if by multiplying them above Measure, a Door be not opened for admitting too many Members of ordinary Capacities; and if Care is taken that all such Distinction be set aside as might disgust or keep out those who are qualified to enlighten

Preface by the Editors.

enlighten others; if no Superiority be regarded but that of Genius; if Esteem be made the Reward of Labour; and if Rewards are conferred upon superior Merit, and no Way diverted by Cabal or Intrigue. The Improvement of Science is more obstructed by the misplacing of Rewards, than by allotting none. It must be acknowledged, to the Honour of Learning, that Rewards are not always necessary to multiply learned Men in a Nation. In *England*, the Sciences thrive without the least Encouragement from the Government. The *English* venerate the Arts and Sciences; which is doubtless the surest Means of promoting them. The Government there disposes of Places; but the Public dispenses Esteem. The Love of Learning, which is a Merit in the *English*, is only Fashion with us; and perhaps will never be more. But however dangerous this Fashion may prove, by producing a Hundred ignorant, insolent Pretenders to Learning, for one learned *Mecænas*; yet perhaps it is owing to this Fashion, that we are not yet fallen into Barbarism; with which we are threatened by numerous Circumstances. A principal one of this Kind is our Passion for false Wit, and false Ridicule; which screens Ignorance that triumphs therein, and will sooner or later spread over the Nation. This will be the Produce, and the Period, of false Taste; and perhaps its Cure. Every Thing has its determined Revolution:
and

Preface by the Editors.

III

and dark Ages must end with the Birth of Light. We are more strongly affected with Sun-shine for having lived long without it. A dark Age resembles Anarchy, which, though bad in itself, sometimes produces happy Consequences. But such a dreadful Revolution is not to be wished for. Barbarism, when it comes, may continue for Ages, and prove like a natural Element; whilst Philosophy and true Taste are transient, or of short Duration.

And here perhaps it might be proper to answer the Objections which an eloquent Philosopher * hath lately made to the Arts and Sciences; as if they corrupted the Morals of Mankind. It would ill become us, at the Head of this Work, to declare ourselves of his Opinion. The valuable Author appears to approve of our Labour, by the happy Zeal wherewith he hath contributed to promote it. We will not reply, that he hath confounded the Improvement of Knowledge with the Abuse that may be made of it. He would doubtless rejoin, that this Abuse

* Mr. Rousseau, of Geneva (Author of that Part of our Dictionary which comprehends Music; and which we believe will please the Public) composed an eloquent Discourse, to prove that the Revival of Arts and Sciences hath hurt Morality. This Discourse, in the Year 1750, obtained the Prize in the Academy of *Dijon*, with great Applause. It was printed at *Paris* in the Beginning of the Year 1751, and hath done great Honour to its Author.

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of Knowledge is its inseparable Companion: but we beg him to consider, whether most of the Evils he attributes to the Arts and Sciences, are not Effects of different Causes, too delicate and tedious here to enumerate. Learning certainly contributes to adorn Society: but it might be difficult to prove that it renders Mankind more moral, or virtuous; which is an Advantage that may be disputed even with Ethics. But should our Laws be abolished, because they screen some Vices, which would be punished in a Republic of Savages? We are far from making Concessions to the Disadvantage of Learning; and still farther from allowing that Mankind would be Gainers by its Destruction: for in that Case, Vices would still remain, with Ignorance thrown into the Scale.

The different Forms of Government, having a great Influence upon Mens Minds, and the Cultivation of Learning, determine the Kinds of Knowledge that flourish in each State respectively. In Republics there must be more Orators, Historians, and Philosophers; and in Monarchies more Poets, Divines and Geometricians. This Rule however is not general; but admits of Exceptions and Alterations, from a great Variety of Causes.

*Particular
Account of
the Ency-
clopedia.*

After premising these Observations, we come to give a particular Account of our Work. The Proposals for it, drawn up and published by my Colleague, M. Diderot, having

having been received with great Applause by all *Europe*, I now, in his Name, present them again to the Public, altered and improved by us both, where it was thought proper.

IT is certain that the general Knowledge, diffused among Mankind, since the Restoration of Learning, is greatly owing to Dictionaries; as containing the Seeds of Science, which gradually rise towards Perfection. The obvious Utility of such Works hath made them so common, that the publishing of more is at present harder to justify, than recommend. It is alledged, that by multiplying these Helps, and thus facilitating Knowledge, the Ardour for Study and Application is cooled. But we think the present Indolence, and Depavation of Taste, more owing to a Rage of extolling Wit, and decrying Science, than to the Increase of Dictionaries: which at most give only some tolerable Instruction to those who, without their Help, would not have had Resolution to procure it; but never supply the Place of other Books to such as desire a thorough Information. The very Form of a Dictionary renders it improper to be connectedly read; or more than occasionally consulted. It would be ridiculous for a Person desirous of acquiring a perfect Knowledge of History, to read only *Moreri's Dictionary*. Were we not persuaded that the Means of Instruction cannot be made too easy, we should

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rather attribute the Defect in Question, to our Swarms of Books under the Titles of *Methods, Elements, Systems, Compendiums, &c.* The Means of procuring Knowledge may still be greatly shortened, by reducing all the Discoveries hitherto made in the Arts and Sciences, to a few Volumes. The Scheme perhaps is not impracticable; and might even comprehend all the useful historical Facts. The Execution of it deserves to be attempted; and we propose in our Work to give the Sketch for it. Were the Design completed, it would disembaras us from a Multitude of Books, which are only copied from one another.

The Objections made to Dictionaries, equally affect the most valuable Literary Journals, or Accounts of Books, published in Europe. Such Journals are of acknowledged Utility; as they shew, in Epitome, every new Discovery made by the Moderns; supply the Place of the Books themselves, by giving us only the Substance of them; and, consequently removing Difficulties in the Way to Science: for good Extracts save the Trouble of much useless Reading.

We therefore judged it of great Importance to procure a proper Dictionary, that may be consulted upon every Article of the Arts and Sciences; and at the same Time serve as a Guide to those who dare nobly undertake to inform the World, or only aim at informing themselves.

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So great a Work was never attempted, at least never executed, before. *Leibnitz*, who was an universal Scholar, and very well knew all the *Encyclopædias* extant, wished the Difficulties attending such a Work, might be conquered.

Most of those *Encyclopædias* were published before the last Century; and tolerably received: for though they did not shew much Genius, they at least shewed Labour and Learning. But such *Encyclopædias* are of little Use to the present Age; wherein the Arts and Sciences have made such a farther Progress. Many Truths are at present discovered, which then remained unknown. True Philosophy was then in its Infancy. The Geometry of Infinites was not yet discovered; nor Experimental Philosophy begun; a genuine Logic was wanting; so were the Laws of just Criticism; and the grand Reformers of the Sciences, mentioned above, had not yet appeared. The Learned of that Time were excited by no true Spirit of Enquiry, or Emulation; no Taste for Exactness and Method was shewn in the different Branches of Learning: and the various Societies and Academies, whose Labours have so greatly improved the Arts and Sciences, were not yet instituted.

But as the Discoveries of the great Reformers of the Sciences, and these learned Societies, have furnished Plenty of Materials for the Purpose; so large an Increase of the Stock, must, in other Respects, needs add to

the Difficulties of composing an Encyclopædia. We do not, however, pretend to tax the former Writers of Universal Dictionaries with Temerity or Presumption; but shall leave them in the quiet Possession of their due Reputation. Mr. *Chambers* is the most distinguished among them. We have particular Reasons to weigh the Merit of his *Cyclopædia*, which has gone quick through many Editions at *London*; is lately translated into *Italian*; and deserves all the Honours paid to it in *England*, and other Nations. It must, at the same Time, be acknowledged, that he borrowed the greatest Part of his Materials from *French* Writers: insomuch that our Nation would have been disgusted with a bare Translation thereof. It would have raised the Indignation of the Learned, and the Clamours of the Public, to have presented them, under a new and specious Title, Materials of which they were already in Possession.

We by no Means refuse this Author his deserved Praise. He was perfectly acquainted with the systematical Order of the Arts and Sciences; or that Chain by which we may descend, without Interruption, from the first Principles of an Art, or Science, to its remotest Consequences; and re-ascend by the same Steps, pass imperceptibly from one Science, or Art, to another; and, if we may be allowed the Expression, make the Tour of the Literary World, without ever missing the Road. We acknowledge the Plan and Design of his Dictionary

Dictionary to be excellent; and, if duly executed, might contribute more to the Advancement of true Science, than half the Books in *Europe*. But, notwithstanding all our Obligations to this Author, and the great Advantages we have derived from his Work, we could not avoid perceiving it required great Additions. And indeed, can it be conceived that two Folio Volumes should contain the Substance of all the Arts, and all the Sciences? The complete Enumeration of the very Articles, in so extensive a Subject, might alone require a Volume; and, of course, numerous Articles must have been dropped, or imperfectly described, in his Work.

These are not Conjectures. We read over the whole Translation of *Chambers's* Dictionary, and found a prodigious Multitude of Things omitted in the Sciences. In the Liberal Arts, he has often only a Line where Pages are required: and for the Mechanic Arts, he scarce has touched them. *Chambers* had read Books, but rarely visited Artists, or Work-shops: and many Things are to be learned by no other means. Omissions in an Encyclopædia, are not the same as in other Cases. In a common Dictionary, an Article omitted only renders the Work imperfect; but in an Encyclopædia it breaks the Connection, and affects the Frame and Foundation of the Design. It required all Mr. *Chambers's* Skill to palliate this Defect in his Work *.

* The Translator has frequently heard Mr. *Chambers* acknowledge all this of his Work. He was very sensible of its Defects; and had laid in a large Stock of Materials to have rendered it more complete, if his Life had been prolonged: These Materials, however, are now digested, and will soon be

But Mr. *Chambers's* Work is not the only Foundation we have built upon. We have done many of his Articles anew ; and inserted scarce any of the rest without Addition, Correction, or Abbreviation. He is therefore only among the Number of Authors whom we have particularly consulted. The favourable Reception of the Proposals, published about six Years ago, for a *French* Translation of his *Cyclopædia*, was a sufficient Inducement with us to use his Work, as much as was consistent with the designed Perfection of our own. The Mathematical Part appeared most worthy of being retained ; but the considerable Alterations made therein may serve as a Specimen how much both that, and the other Parts, stood in need of a careful Revival.

A primary Thing wherein we depart from this *English* Author, is his genealogical Table of the Arts and Sciences ; and in its Stead have substituted another, which spreads the Canvas for a Work, of several Folio Volumes, one Day to comprise all human Knowledge.

At the Sight of so extensive a Plan, every Reader will immediately cry out, that daily Experience shews how difficult it is for an Author to explain, fundamentally, any one Art, or Science, which has been the principal Study of his Life ; what Rashness, or Ignorance, then,

published, together with many new Discoveries, and Improvements, by a very judicious Gentleman, well known in the Republick of Letters, for his excellent Performances. His Supplement will be so considerable as to make two Volumes in Folio.

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must that Man shew who singly undertakes to treat of all the Arts and all the Sciences? That so great a Weight might be supported, we have divided it; and procured a sufficient Number of Philosophers, and Artists, to bear their Share; Philosophers excelling in their different Ways, and Artists distinguished by superior Abilities, in the respective Parts they have undertaken. Each of them has his Share in his own Province; and some had finished their Quota before the Work was projected. Their Names will soon appear; and we are persuaded the Public will not disapprove our Choice. And thus every Member, being employed in the Part he understands, is not only enabled to form a Judgment of what the Ancients, or Moderns, have delivered upon the same Subject, but also to add his own Stock to theirs. No one of them has entreated upon the Province of another, nor touched a Subject he was not a Master of. And hence the several Articles of our Dictionary are treated with more Method, and more Certainty, greater Extent, and greater Particularity, than common Dictionary-Writers could possibly shew. Such a Disposition indeed eclipses the Merit of the Editors; but contributes greatly to the Perfection of the Work: and we shall always think it Glory enough to ourselves, if the Public be satisfied. In one Word, each of our Associates compiled a Dictionary of the Part he undertook; and we, as Editors, have joined their several Dictionaries into one.

Many Reasons determine us to observe the Alphabetical Order in our Work; especially as this fits it for the more ready and commodious Perusal of the Reader, who, wanting to know the Meaning of a Word, can sooner find it in this Manner, than in any other. Had we treated all the Sciences separately, and made a Dictionary of each Science respectively; the supposed Confusion of Alphabetical Order must equally have taken Place in this Disposition, and been subject to many Inconveniencies, on Account of the numerous Words that are common to different Sciences; which Words, in that Case, would have been either frequently repeated, or arbitrarily placed. On the other hand, had each Science been treated in a continued separate Discourse, according to the natural Order of our Ideas, and not according to the Alphabetical Order of Words, the Form of this Work would have been extremely inconvenient for the Generality of our Readers, who could not then have easily found the Article they wanted; and, at the same Time, the systematical Order, or Connection of the Arts and Sciences, would not have appeared; and the systematical Chain of Words, or rather their Objects, which connect the Sciences, or link them together, must have been greatly broke; whereas both these Advantages are easily preserved upon our Plan, as appears above. And if we had proposed to procure particular separate Treatises upon all the Arts and all the Sciences, in the common Method,

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and afterwards to have presented these under the Title of an *Encyclopædia*, it would have been difficult to find an adequate Number of Hands for the Purpose; as most of our Associates would doubtless have chose to publish their respective Pieces separate, rather than submit to their being intermixed with such a Number of others. And thus we should also have been prevented from availing ourselves of Mr. *Chambers's* Dictionary: which would have been derogatory to the just Reputation of that Work, and the Approbation given to our original Proposals for printing a Translation thereof. The entire Translation of that Work was put into our Hands by the Booksellers, who had undertaken to print it; and we distributed it to our Collegues, who, at first, rather chose to revise, correct, and enlarge it, than to compose their several Parts anew, without being provided with Materials. Indeed, a great Part of the *English Cyclopædia* was of no Use to our Collegues, any farther than it made them more resolutely execute what was desired of them; which many, perhaps, might never have done, had they foreseen the Labour it would cost them. Some of these learned Gentlemen, in Possession of their Parts long before we undertook to be Editors, had made a considerable Progress, in following the original Design of the Alphabetical Order: and hence it was impossible for us to have altered this Order, even

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if we had happened to disapprove it. Nor have we ever heard the Alphabetical Order disapproved of in Mr. *Chambers*; whom herein we follow as our Model. Every Consideration therefore obliges us to pursue this Plan, which, if left to ourselves, would have been our own Choice.

The only Part of our Province that required Discernment, was to fill up the Chasms, left by our Collegues, between two contiguous Sciences, or Arts; or to connect the Chain where they had broke off, and consigned such Articles over to one another, as appeared belonging equally to different Persons, and therefore remained untouched by them all. But that no one of our Coadjutors may be blamed for the Faults to be found in these supplemental Parts, we shall distinguish them by an Asteric. We esteem the Performance of each Author sacred; but shall not fail of consulting any of them, if, whilst the Work is printing, any of their Parts should seem to require considerable Alteration.

The different Hands employed in this Work have placed their Signatures at the End of each Article; which may serve to denote not only each Author's particular Style, but the Kind of Writing proper for each Subject. A Process of Chemistry will not be wrote like a Description of the ancient Baths and Theatres; nor the Business of a Lock-smith be delivered like a Theological Enquiry, or an Article of Faith. Every Thing has its proper Colouring:

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Uniformity of Writing in the various Articles, would produce Confusion. Purity, Simplicity, and Accuracy of Style, are the only Qualifications that all the Subjects should have in common; and such Qualifications we hope will not be found wanting. To have endeavoured at more than this, would but have produced that tiresome Monotony, and Disgust, which we generally find in Works of Length: and from which the present Work is happily exempted, by the great Variety of Matters it treats.

Thus much we presume may explain the Nature of our Undertaking to the Public, which has been pleased to interest itself in our Favour. We have shewn the general Advantages to be expected from its due Execution; the encouraging and discouraging Success of those who have attempted the same Thing before us; the Extent of our Design; the Order we have observed; the Distribution of the Parts; and our own particular Office as Editors. We now proceed to give a particular Account of the Manner wherein this Work is designed to be executed.

The Matter of our Encyclopædia may be ranged under three Heads; viz. the Sciences; the Liberal Arts; and the Mechanic Arts. We shall here begin with considering the Sciences, proceed to the Liberal Arts, and conclude with the Mechanic Arts.

There are numerous Books upon the Sciences; and Treatises of the Liberal Arts are multiplied without Number; insomuch that the

the Republic of Letters is deluged with them: and yet very few Authors deliver the true Principles of either. Many have stifled them by a Redundancy of Words, or buried them under affected Obscurity. Numbers, imposed upon by Authority, place a Falshood contiguous to a Truth; and thus either discredit the Truth, or propagate the Falshood. It would doubtless be more useful to have had fewer Books, and better.

Among all Writers we have given the Preference to such as are generally allowed the best; and derived our Principles of the Sciences from them. To a clear and precise Explanation of these Principles, we have subjoined such Examples, or Authorities, as have been constantly received. The common Method in Dictionaries has been vaguely referring to Originals; or quoting them at large, but often unfairly, and seldom distinctly: whence in the different Parts of an Article, the Reader is at a Loss what Author to consult on a particular Point, or whether he should consult them all; which renders the Search laborious, and the Verification tedious. This Inconvenience we have studied, as much as possible, to avoid, by quoting, in the Body of each Article, the Authors on whose Testimony we rely; and giving his own Words if necessary. Through the whole we compare Opinions; weigh Arguments; raise or remove Objections; sometimes confute Errors; combat Prejudices, or endeavour, as much as possible,
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not to multiply, or perpetuate them, by defending exploded Notions without Examination; or, without Reason, rejecting received Opinions. Where the Interest of Truth, or the Importance of the Subject, require a full Consideration, we have not scrupled to be diffusive; always preferring Instruction to Entertainment.

In the general Articles of the Sciences, we have conformed to the constant Practice of Writers, who begin each Science with giving a Definition thereof. These Definitions we lay down in as simple and concise a Manner as possible. But the Reader is not to expect that the Definition of a Science, especially of the abstract Kind, can convey an Idea of it to those who are perfectly unacquainted with the Science. By a Science, we mean a collective Body of Rules, or Facts, relating to a certain Object: whence it is impossible, by a Definition, to give an Idea of such a Body, to a Person entirely ignorant of what it contains. When we say that Arithmetic is the Science of the Properties of Numbers; this no more explains what Arithmetic is, to one who knows nothing of that Science, than we explain the Philosophers Stone, by saying, it is the Secret of making Gold. The Definition of a Science properly consists in a particular Explanation of its various Objects; as the Definition of a natural Body is a particular Description of its component Parts: and accordingly it appears to us that the Definition of every Science should

should rather be placed by Authors at the End, than at the Beginning of their Works; as the ultimate Result of all the Notions acquired by reading, or studying, the Science. Vulgar Definitions seldom give us more than vague, abstract Terms, more difficult to fix the Meaning of, than of the Science itself; as for Example, the Words *Science*, *Number*, *Property*, in the Definition above given of Arithmetic. General Terms are doubtless necessary; and we have already shewn their Use: but they may be defined a forced Abuse of Signs; as most Definitions are, sometimes a voluntary, and sometimes a forced Abuse of general Terms. But herein, as was said above, we have complied with a Custom, which we have no Power to change; nor would the Form of our Dictionary allow of it. But, though we thus submit to the vulgar Prejudice, we thought proper to declare our real Sentiments upon the Practice.

The Kingdom of the Arts and Sciences is a remote World to the Vulgar; and new Discoveries are daily made therein: though many fabulous Relations are given of them. We judge it of Importance to ascertain such as are just, guard against such as are false, mark their Origins; and this with a View to facilitate farther Discoveries. We collect Facts, compare Experiments, and contrive Methods, in Hopes of exciting Men of Genius to strike out new Paths of Science, and advance Knowledge, by beginning where our great Predecessors left off.

off. This End we propose to answer by subjoining to the Principles of the Liberal Arts, an Account of their Rise and Progress. And if we have been successful in this Attempt, Men of Ingenuity need not, for the future, misemploy their Time in searching after Things already discovered. It will also hence be easy to distinguish betwixt that which Authors add of their own, and what they borrow, in writing upon the Sciences. The Public likewise, will hence be better enabled to judge of Performances; and readily unmask those Pretenders, who, fond of Reputation, but wanting Genius, presume to republish old Systems for new Discoveries. But, to secure these Advantages, it was necessary to give each Article its suitable Length; dwell upon Essentials; slight minuter Matters; and avoid the common Faults of haranguing, or proving what was never contested, and explaining what was never obscure. We have neither been sparing nor lavish of our Explanations: they were thought necessary wherever we have used them, and superfluous wherever they are omitted. We have not accumulated Proofs where a single Reason was sufficient; nor multiplied them, but where the Strength depended on their Number, or Coincidence.

Such Articles as regard the Elements of the Sciences, are executed with all possible Care; as being the Ground-Work, or Foundation, of the rest. The Elements of a Science can therefore never be well laid down, but by those

those who are deep in the Science : for Elements are a Collection of the general Principles that extend to the different Parts of a Science : and to understand the most suitable Manner of delivering these Principles, requires a previous Knowledge of their Use, and various Application.

These are the necessary Precautions we had to take ; and this the Stock we had to depend on. Indeed we have received additional Treasure ; which our Undertaking owes to its Felicity. Manuscripts have been communicated to us, by Encouragers of Learning, and by the Learned themselves ; among whom we must name M. *Formey*, Perpetual Secretary of the Royal *Prussian* Academy of Sciences and *Belles Letters*. This illustrious Academician had projected a Dictionary like ours, and executed a considerable Part of it, which he has generously presented to us, and of which we shall not fail to give him the Honour. We have also received numerous Enquiries and Observations, which the several Artists, and Men of Learning, employed in this Dictionary, had already prepared ; and which they take this Method of publishing. Among these are most of the Articles relating to Grammar in general, and particular ; so that we may justly say, no other Work hitherto published, is so rich or instructive, with regard to the Rules and Usage of the *French* Language, or the Nature, Origin, and Philosophy of Language in general. And thus
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thus we shall communicate to the Public a Fund of Learning in the Liberal Arts and Sciences, which perhaps would otherwise never have been published.

Nay, what farther contributes towards the Perfection of these two important Branches of Science, we have received the most obliging Assistance from all Quarters: the Protection of the Great; the Favour and Correspondance of the Learned; public Libraries, private Cabinets, Collections, Papers, &c. all have been opened to us. Some Address, and great Expence, obtained what could not be procured by Favour. Gratifications seldom failed to subdue the real Difficulties, or pretended Scruples, of those we were necessitated to consult.

We are particularly sensible of our Obligations to the Abbé *Sallier*, Keeper of the King's Library; who, with his natural Politeness, heightened by the Pleasure of encouraging so great an Undertaking, permitted us to select, from among the rich Stores in his Keeping, whatever might improve, or grace our Encyclopædia. Such an obliging Conformity to the Views of his Master, not only justifies, but even honours his Majesty's Choice. The whole Body of Arts and Sciences cannot sufficiently illustrate a Reign that favours them so highly. For our own Parts, we are no more than Spectators of their Progress, and act but as Historians: by transmitting them down to future Ages. Let Posterity, upon
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consulting our Dictionary, say, such was then the State of the Politer Arts and Sciences. May Posterity add their Discoveries to those we have registered; and may the History of the human Mind, and its Productions, be continued, from Age to Age, down to the most distant Period of Time! May the Encyclopædia remain a Sanctuary, to preserve human Knowledge from the Ravages and Revolutions of distant Ages! But shall we presume to have the Pleasure of laying a just Foundation for so great a Work? What an Advantage would it have been to our Forefathers, and to us, had the Labours of the Ancients, the *Egyptians*, *Chaldeans*, *Greeks*, *Romans*, &c. been transmitted down in an Encyclopædia; and had they delivered, at the same time, the real Principles of their respective Languages? Let us do for succeeding Ages what we regret was not done for us. If the Ancients, who accomplished so many great Works, had wrote an Encyclopædia; and this single Manuscript had escaped the Fate of the *Alexandrian* Library, it would have sufficed to compensate the Loss of the rest. And so much for the Sciences, and Politer Arts.

Our Conduct in the Mechanic Arts required no less Pains and Attention. Never, perhaps, did so many Difficulties occur together; with so little Assistance in Books to surmount them. Too much has been written upon the Sciences; but too little upon most of the Liberal Arts; and scarce any thing at all upon the Mechanic

Mechanic Arts: for Authors here deliver extremely little in proportion to the Extent and Fertility of the Subject. Among those who have wrote the best, some were slenderly informed, so as only to shew us the Necessity of writing better; others only just touch upon the Subject, and treat it more like Grammarians, or Men of Letters, than Artists: others, again, are more explicit, and better acquainted with Practice, but yet so imperfect, that the Operations of Artificers, and the Descriptions of their Machines, which alone are sufficient to fill Volumes, make only an inconsiderable Part of their Writings. *Chambers* has added little, on this Head, to what he translated from *French Writers*. And hence we were obliged to have Recourse to Workmen themselves: and accordingly applied to the best in *Paris*, and the Kingdom of *France*. We were at the Pains of visiting them at their Work; to ask them Questions; write down their Informations; clear up and methodize their Thoughts; learn the proper Terms in their Arts; form them into Tables; define them; converse with the Persons who delivered us any Memoirs in Writing: and found it extremely necessary to rectify, by long and frequent Conversations with some, what was but obscurely, and often imperfectly, or even falsely related by others. Some Artists indeed are at the same Time Men of Learning; and we could name a few; but their Number is small, as most Mechanics apply to their re-

spective Arts only from Necessity; and work by Instinct. Scarce above one in a Hundred can express himself clearly on the Instruments he employs, or the Works he produces. We have met with Men who had worked forty Years at their Trade, without knowing the Structure of the Machines they employed. With such Persons we were obliged to practise the laborious subtile Art which *Socrates* gloried in; and have acted as Midwives to their Minds.

But some of the Trades are so singular, and their Ways of Working so delicate, that unless an Author operates at them himself, moves the Machine with his own Hands, and sees the Work rise under his Eye, he can scarce describe it exactly. Hence we were often obliged to procure the Machines, construct them, set our own Hands to the Plough, serve as it were an Apprenticeship, and make but indifferent Work ourselves, with a View of instructing others how to make better.

And by this Means we became convinced of the general Ignorance that prevails amongst Mankind, with regard to most of the Objects in common Life, and of the Difficulty of curing it. We are hereby enabled to shew, that even the Learned, who are best acquainted with their own Language, scarce understand the twentieth Part of its Words; that, though each Art has a Language peculiar to itself, yet this Language is very imperfect; that it is only by a long Habit of conversing together that Workmen

men understand one another ; and this more by Means of the frequent Returns of similar Occasions, than by the Use of Terms. In a Workshop it is the Occasion that speaks, rather than the Artist, and the Eye gives more Information than the Ear.

The Method we have followed in each Art is this. We treat (1) of the Materials ; the Places where they are found ; the Manner of preparing them ; their good and bad Qualities ; their different Kinds ; the Operations they undergo, either before, or at the Time of using them.

(2) Of the principal Works made of them ; and the Manner of operating in the Production.

(3) We give the Name, Description, and Figure of the Utensils, Tools, and Machines, both in their separate Parts, and as they are compounded, or put together for Use ; the Figure or Section of the Moulds, and other Instruments, whose Inside it is necessary to know ; their Profils, &c.

(4) We explain and represent the Hand at Work, and the principal Operations, in one or more Plates ; where sometimes only the Hand of the Artist appears employed ; and at others his entire Body in Action upon the most essential Part of his Art.

(5) We collect, and with the utmost Exactness define, all the peculiar Terms of each Art.

But as the Want of a Habit of writing and of reading Treatises on the Mechanic Arts,

renders a clear Explanation of them difficult, we have found an absolute Necessity of illustrating our Work with Plates. It might be shewn, by a thousand Examples, that a Dictionary merely consisting of the most accurate Definitions of Arts, would still require Plates, to prevent vague and obscure Description: how much more necessary then must their Assistance be in our Encyclopædia? The bare View of an Object, or its Figure, may give more Information than Pages of Words.

We employed proper Designers, to take Draughts of the Machines, and Utensils, found in Workshops; and have omitted nothing that might contribute to give a distinct Representation of them. Where a Machine requires particular Attention, on Account of its important Use, or the Multiplicity of its Parts, we begin with its simple, and gradually proceed to its compound State. We first collect together, in one Figure, as many of the simple Parts as could be distinctly exhibited; in a second Figure, the same Parts are represented along with others; and in this Manner we have successively represented the most complicated Machines, without Confusion, either to the Mind, or Sight. It is sometimes necessary to rise, from the Work produced to a Consideration of the Machine; and at others to descend from the Knowledge of the Machine to that of the Work. Under the Article ART the Reader will find some Reflections on the Advantages of
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of these Methods ; with the proper Occasions of employing them, and preferring the one to the other.

All Men have certain Ideas in common, which their own Minds present more clearly than Words can do. There are also Objects so familiar, that it would be ridiculous to give Drawings of them : whilst the Mechanic Arts have others so complicated, that no Figures could usefully represent them. In the two first Cases, we trust to the Reader's Understanding, and Experience ; and in the last, we refer to the Object itself. There is a proper Medium in all Things : and we endeavour to observe it. To treat any one Art at full Length, and give it all the possible Plates, might alone require numerous Volumes. It would be needless to represent in Plates all the different States through which a Piece of Iron passes before it is brought into a Needle. The whole Process indeed of every Artist must be circumstantially described ; but we design our Figures only to represent the most momentous Actions, or Address, of the Artist, in those Niceties of the Operation, which are easy to draw, but very difficult to explain by Words. We chiefly confine our Plates to essential Circumstances ; which when once well represented, necessarily shew the rest. We do not place Crosses the whole Length of a Road ; but only in such Places, where the Traveller might be apt to mistake his Way.

After all, it is Practice, and manual Operation, not Books, that makes an Artist. But Artists will find in our Dictionary many Views which perhaps they might not otherwise have had; and numerous Observations which might have cost them many Years Labour to make. We present to the diligent Reader what he might have learned from Artists, by seeing them employed at their Work; and to Artists, what it were to be wished they would learn from Philosophy, in order to perfect their Works.

We have observed the like Method, and Oeconomy, in our Figures, and Plates, belonging to the Liberal Arts and Sciences, as in those of the Mechanic Arts; but could not reduce the whole to less than Six Hundred. The two Volumes which these Plates will make, is an extremely useful Part of the Work; as we shall annex an Explanation of each Plate on the opposite Page, with References to the respective Articles of the Dictionary whereto it belongs. Thus a Reader opening a Volume of the Plates, and seeing a Machine that raises his Curiosity, suppose a Powder-Mill, Paper-Mill, Silk-Mill, Sugar-Mill, &c. on the opposite Page he finds Fig. 50, 51, or 60, &c. *Powder-Mill, Paper-Mill, Silk-Mill, Sugar-Mill, &c.* with a succinct Explanation of these Machines, and References to the Articles, POWDER, PAPER, SILK, SUGAR, &c.

The Engraving will correspond with the Perfection of the Designs; and we hope the
Plates

Plates of our Encyclopædia will surpass those of the *English Dictionary*, as much in Beauty, as in Number. Mr. *Chambers's Work* has thirty; the original Proposals for a Translation of that Work promised one hundred and twenty; and we shall give at least six hundred. It is no Wonder the Work should grow under our Hands. The Design is immense: and we by no Means presume to have finished it.

Notwithstanding all the Assistances and Labours above-mentioned, we frankly declare, in the Name of our Collegues, and of ourselves, that we are ready always to acknowledge our own Insufficiency; and desirous of receiving farther Information. We shall with Gratitude receive the Communication of any new Lights, and readily conform to them: so much are we persuaded that the ultimate Perfection of an Encyclopædia is the Work of Ages. Such a Work has required some Centuries to set it on Foot; and more are required to complete it. We shall content ourselves with having contributed to lay the Foundation.

We shall always enjoy the internal Satisfaction of having spared no Pains to succeed. As a Proof of it, we have done several Parts of the Arts and Sciences no less than thrice over: and cannot here omit mentioning, to the Honour of the Booksellers concerned in the Work, that they readily complied with whatever was proposed for perfecting it. The joint Concurrence of so many Circumstances,
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the Abilities of the Compilers, the mutual Assistance of all the Associates, the Emulation of the Editors, and the Compliance of the Booksellers, must needs produce a suitable Effect.

From the whole it appears that our Work treats of the Arts and Sciences, without supposing any previous Knowledge of them in the Reader; that it delivers the most useful Knowledge in every Subject; and that the Articles mutually explain and illustrate each other, without any Confusion arising from the Alphabetical Order observed. And hence we reasonably infer, that this Encyclopædia may, hereafter, supply the Place of a Library to Gentlemen, and even to Men of Letters, except in particular Sciences which make the principal Object of their Studies; that it will explain the true Principles of Things; point out their Relations; assist in the ascertaining and improving of human Knowledge; and by increasing the Numbers of the truly Learned, of excellent Artists, and judicious Admirers, diffuse many new Advantages over the Nation.

Nothing farther remains but letting the Public know the learned Names it is no less obliged to, for this Work, than to us. In mentioning of them, we shall, as nearly as possible, observe the Encyclopædiac Order of the Subjects they have respectively charged themselves with. We chuse this Method, to avoid the Appearance of giving any Precedency in Merit or Distinction. The Articles
belonging

belonging to each are marked in the Body of the Work, by particular Letters, of which the Reader will find a List at the Beginning of the Work.

The *Natural History* we owe to Mr. *Daubenton*, Doctor of Physic, and Member of the Royal Academy of Sciences, Keeper and Demonstrator of the Cabinet of Natural History. This Cabinet is an immense Collection, made with great Judgment and Accuracy; and in such able Hands cannot fail of being carried to the greatest Perfection. Mr. *Daubenton* is the worthy Colleague of Mr. *Buffon*, in that great Work upon Natural History, the three first Volumes whereof are already published, and quickly passed through three successive Editions. The Public waits for the rest with Impatience. In the Mercury for the Month of *March* 1751, we inserted the Article *BEE*, which Mr. *Daubenton* drew up for our Encyclopædia: and the general Success that Article met with, engaged us to publish, in the second Volume of the Mercury for *June* 1751, the Article *AGATE*. It appears by this Article, how far Mr. *Daubenton* is capable of enriching our Work with Remarks, and new Discoveries, in the Part he has undertaken: and, with what Elegance and Accuracy he can represent Things already known, appears in the Article *BEE*.

The *Theology* is the Work of Mr. l'Abbé *Mallet*, Doctor of Divinity, of the Faculty of *Paris*, of the House and Society of *Navarre*,

Navarre, and Regius Professor of Theology at *Paris*. His Knowledge and Merit alone, without any Application from himself, procured him the Chair he fills. This, in the present Age, is no small Encomium. Mr. l'Abbé *Mallet* is likewise Author of all the Articles upon *Ancient and Modern History*: a Subject with which he is exceedingly well acquainted; as will appear by his curious and important Work of this Kind, now preparing for the Press. But the Reader will observe that the Historical Articles in our Work, do not extend to the Names of Kings, learned Men, or Nations, which are the particular Object of *Moreri's* Dictionary; and would have swelled ours to nearly double the Bulk. We are obliged to Mr. l'Abbé *Mallet* for all the Articles belonging to *Poetry*, *Eloquence*, and *Literature*, in general. He has already published two Books of this Kind, full of useful and judicious Reflections. One is his *Essay upon the Study of the Belles Lettres*; and the other his *Principles for studying the Poets*. These Particulars shew how highly serviceable Mr. l'Abbé *Mallet* has been to this Encyclopædia, by his extensive Knowledge and great Variety of Talents.

The Articles on *Grammar* are by Mr. *DUMARSAIS*, whose Name alone is sufficient to recommend them.

The *Metaphysics*, *Logic*, and *Ethics*, are done by Mr. l'Abbé *Rvon*; a profound Metaphysician, and, which is still more extraordinary,

nary, an exceeding clear Writer; as the Reader may judge by those Articles of his which occur in this first Volume, and among others, by the Article ACT; to which we refer, not as being better than the rest, but because being short, it shews at once the Soundness of Mr. l'Abbé *Yvon's* Philosophy, and the Clearness and Accuracy of his Metaphysics. Mr. l'Abbé *Pestré*, who, for his Learning and Merit, is a worthy Second to Mr. l'Abbé *Yvon*, assisted him in several of the Articles on Morality. We cheerfully embrace this Opportunity of acquainting the Public that Mr. l'Abbé *Yvon*, in Conjunction with Mr. l'Abbé *Prades*, are now preparing a Work upon the Subject of Religion: a Work so much the more valuable, as it is performed by two intelligent Philosophers.

Law by Mr. *Toussaint*, Advocate in Parliament, and Member of the Royal Academy of Sciences and Belles Letters of *Prussia*: a Title for which he is obliged to his extensive Knowledge, and extraordinary Talents in Writing; which have gained him great Reputation in the Republic of Letters.

Heraldry by Mr. *Eidous*, formerly Engineer to the Armies of his Catholic Majesty. The Republic of Letters is indebted to him for the Translations of several excellent Books of different Kinds.

The *Arithmetic*, and *elementary Parts of Geometry*, were reviewed by Mr. l'Abbé *de la Chappelle*, Cenfor Royal; and Fellow
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of the Royal Society of *London*. His *Institutions of Geometry*, and his *Treatise of Conic Sections*, justify, by their Success, the Approbation given of them by the Royal Academy of Sciences.

The Articles of *Fortification*, *Tactics*, and the *Military Art* in general, are done by Mr. *Le Blond*, Professor of Mathematics to the Pages of the King's grand Equerry. He is well known to the Public by several Works justly esteemed, and among others his *Elements of Fortification*, often reprinted; and by his *Essay upon Castrametation*, his *Elements of War by Sieges*, and his *Arithmetic and Geometry for Officers*, which the Academy of Sciences highly approved of.

Stone-Cutting by Mr. *Goussier*, who is very well versed in all the Parts of Mathematics and Natural Philosophy; and to whom this Work has many Obligations, as will appear hereafter.

Gardening and Hydraulics by Mr. *D'Argenville*, Counsellor to the King, Master in Ordinary of his Chamber of Accounts at *Paris*, Fellow of the Royal Societies of *London* and *Montpellier*, and of the Academy of Arches at *Rome*. He is Author of a Book entitled, *The Theory and Practice of Gardening, together with a Treatise of Hydraulics*. The Merit and acknowledged Usefulness of this Work appear by its having undergone four Editions at *Paris*; and two Translations, one into *English*, and the other into *High-Dutch*.

Preface by the Editor.

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Dutch. As this Work only regards elegant Gardens, and as the Author only considers Hydraulics with Relation to Gardens; he has generalised both these Subjects in the *Encyclopædia*, and considered all Sorts of Gardens, for Fruit, Plants, Pulse, &c. He has also added a new Method of pruning Trees; and new Figures of his own Invention. He has likewise enlarged his Hydraulics, and described the best Machines in *Europe* for raising Water; with the Ways of making Sluices and other Works belonging to Water. Mr. *D'Argenville* is otherwise very well known to the Public by several Works of different Kinds, among others by his *Natural History explained in two of its principal Parts, Lithology and Conchyliology*. The Success of the first Part of this History obliges the Author to give a second soon, which will treat of Minerals.

Navigation by Mr. *Bellin*, Censor Royal, and Engineer in Ordinary to the Marine. By this Gentleman's Labours we are possessed of several Sea-Charts, which have been very well received by Pilots and competent Judges. It will appear by our Plates belonging to Navigation, that he is very well acquainted with that useful Branch of Knowledge.

Clock-Work and the *Description of Astronomical Instruments* are done by Mr. *J. B. le Roy*, Son to the famous *Julian le Roy*. To the Instructions he received from his Father, so much esteemed throughout *Europe*, he has

has added great Attainments in Mathematics, Natural Philosophy, and Polite Learning.

Anatomy and Physiology by Mr. *Tarin*, Doctor of Physic; whose Works on this Subject are known and approved by the Learned.

Physic, the Materia Medica, and Pharmacy, by Mr. *de Vandenesse*, Doctor Regent of the Faculty of Physic at *Paris*; and very well versed in the Theory and Practice of his Art.

Surgery by Mr. *Louis*, Graduate Surgeon, Demonstrator Royal at the College of St. *Côme*, and Commissary Counsellor for Extracts of the Royal Academy of Surgery. Mr. *Louis*, though young, being highly esteemed by the most eminent of his Profession, had the Chirurgical Part of this Dictionary assigned him by the Choice of Mr. *de la Peyronie*; to whom Surgery is under great Obligations, as well as our Encyclopædia, for procuring Mr. *Louis* to assist in advancing them both.

Chemistry by Mr. *Malouin*, Doctor Regent of the Faculty of Physic at *Paris*; Cenfor Royal, and Fellow of the Royal Academy of Sciences; Author of a *Treatise of Chemistry*, which has gone through two Editions, and of one upon *Medicinal Chemistry*, which has given great Satisfaction both to the *French* and *Foreigners*.

Painting, Sculpture, and Engraving, by Mr. *Landois*; who, along with the Knowledge of these beautiful Arts, has a ready Genius, and a Talent for Writing.

Architecture

Architecture by Mr. *Blondel*, an Architect celebrated on Account of the many Buildings erected at *Paris* by his Direction; and others designed by him, and executed by several Sovereign Princes; but particularly for his *Treatise on the Decoration of Edifices*, the Plates whereof were engraved by himself, and are greatly esteemed. We are indebted to him for the last Edition of *Daviler*, and three Volumes of *French Architecture*, containing six hundred Plates; which three Volumes will be followed by five more. His Regard to the public Advantage, and his Desire of improving the Arts in *France*, induced him to open, in the Year 1744, a School of Architecture, which was soon filled. Here Mr. *Blondel*, besides instructing his Pupils in Architecture, employed proper Persons to teach Mathematics, Fortification, Perspective, Stone-Cutting, Painting, Sculpture, and other Arts relating to Architecture: so that in every Respect we could not have chose a better Hand for our Encyclopædia.

Mr. *Rousseau*, of *Geneva*, already mentioned as an acute Philosopher, and a Master of the Theory and Practice of *Music*, has given us the Articles belonging to this Science. Some Years ago he published a *Dissertation upon modern Music*; with a new Kind of Notation, which perhaps wants nothing to recommend its Use; if we were not prejudiced in Favour of an old one.

Besides the learned Contributors above-named, there are others who have furnished us with entire Articles of great Consequence; for which we shall not neglect to make our Acknowledgements.

Mr. *le Monnier*, Fellow of the Royal Academies of Sciences at *Paris* and *Berlin*, of the Royal Society of *London*, and Physician in Ordinary to his Majesty at *St. Germain-en-Laye*, presented us the Articles upon the *Loadstone* and *Electricity*; two important Subjects, which he has successfully studied; and delivered excellent Memoirs upon them, to the Academy of Sciences. The Reader will find it observed that the Articles *Aimant* and *Aiguille aimantée*, *Loadstone* and *touched Needle*, in this first Volume, are entirely the Work of this Author; and we shall give the same Notice under all the Articles of his in the succeeding Volumes.

Mr. *de Cabusac*, of the Academy of *Belles Lettres* at *Montauban*, Author of the *Zeneide*, which the Public so frequently sees and applauds on the *French Theatre*; and of the *Festivals of Cupid and Hymen*, and several other Performances, which have met with great Applause upon the *Lyric Theatre*, gave us the Articles *Ball*, *Dance*, *Opera*, *Decoration*, and several others relating to these four: and we shall be careful to apprise the Public of every one he shall oblige us with. In the second Volume comes the Article *Ball*, where he makes such curious Enquiries, and useful
 Obser-

Observations, as shew how thoroughly he has studied the Lyric Theatre.

Mr. *Alembert* has either drawn up or reviewed all the Articles of *Mathematics* and *Natural Philosophy*, that do not depend upon the Parts already mentioned; and furnished some few Articles in the other Branches of Science. In the Articles of *Transcendental Mathematics* he has particularly endeavoured to shew the general Nature of Methods; to point out the best Books, where the most important Particulars in every Subject may be found, that were not fit to enter our Encyclopædia; to clear up what seemed but imperfectly, or scarce at all illustrated before; and, as far as possible, to give accurate and simple Metaphysical Principles in all Cases. A Specimen of his Manner appears in this Volume, under the Articles *Action*, *Application*, *Arithmetic*, &c.

But the Province of Mr. *Diderot* is more laborious; he being Author of the most extensive and important Part of this Dictionary; a Part the most wanted by the Public, and the most difficult to execute; viz. the History of Arts. This History Mr. *Diderot* drew up from Memoirs communicated to him, either by Workmen, or Lovers of the Arts, whose Names we shall mention below; or from the verbal and ocular Information of Artificers employed at their Work, or Handicraftsmen, which he took the Trouble of examining, and sometimes causing Models to be made

of their Engines and Apparatus, that he might study them more at his Leisure. To this complicated Undertaking, which he executed with great Exactness, he hath added another no less considerable, by supplying, in different Parts of our Work, an immense Number of Articles that were wanting. He applied himself to the Task with a Disinterestedness that does Honour to Learning; and a Zeal deserving the Acknowledgement of all Well-wishers to Science; but particularly of the Gentlemen Associates in this Work. This single Volume may witness what a Number of Articles the whole is indebted to this Gentleman for: some of which are extensive, as *Acier*, STEEL, *Aiguille*, NEEDLE, *Ardoise*, SLATE, ANATOMY, ANIMAL, AGRICULTURE, &c. The Success of the Article ART, which he published separate, some Months ago, encouraged him to labour the rest; which the Public may be assured are no way inferior, though upon different Subjects. It is needless to answer the unjust Objections which some Gentlemen have made to this Article, as if it were too subtle and metaphysical. Persons unaccustomed to think upon Subjects that require Attention, are here no competent Judges. An Article that has a general and abstract Term for its Object, cannot be properly treated without having Recourse to philosophical Principles; which are always attended with Difficulties to the Unphilosophical. Though indeed we
have

have, with Pleasure, found many Gentlemen, who perfectly understand this Article. And as to those who have censured it, we wish they may have no greater Reason to censure the other Articles of our Encyclopædia that treat upon similar Subjects.

Many, without furnishing us with entire Articles, have greatly assisted in the Work: we have already mentioned Mr. l'Abbé *Salzier*, and Mr. *Formey*.

Count *Heronville de Claye*, Lieutenant-General of the King's Armies, and Inspector-General of the Infantry, whose great Knowledge in the Art of War has not hindered him from happily cultivating Letters and the Sciences, has presented us with very curious Memoirs, upon *Minerology*; many of the Works being represented in *Relievo*, as the making of *Copper*, *Alum*, green and blue *Vitriol*, &c. in fourteen Pieces. We are also obliged to him for his Memoirs upon *Kaleseed*, *Madder*, &c. belonging to the Art of Dying.

Mr. *Falconet*, Consulting Physician to the King, and Fellow of the Royal Academy of *Belles Lettres*, who possesses a Library as extensive as his Knowledge in the Sciences, and converts it to a still nobler Purpose by obliging Men of Learning with the free and full Ute of it; has afforded us all the Assistance we could wish for. This Gentleman, with his vast Erudition, happy Genius, and philosophical Turn, has been pleased to revise several of our Articles; and to assist us with necessary Lights and useful Instructions.

Mr. *du Pin*, *Fermier-General*, remarkable for his Love of Learning, and the Public Good, procured us all the necessary Information belonging to the Salt-works.

Mr. *Morand*, who does so much Honour to Surgery at *Paris*, and to the several Academies of which he is Member, has communicated many important Observations; one of which occurs in this Volume, under the Article ARTERIOTOMY.

Messieurs *Prades* and *Yvon*, whom we have already mentioned with Approbation, have furnished several Memoirs relating to the History of Philosophy; and some upon Religion.

Mr. l'Abbé *Pestré* has communicated some Memoirs upon Philosophy; which we shall take Care to distinguish in the succeeding Volumes.

Mr. *Deslandes*, formerly Commissary of the *Marine*, furnished some important Remarks relating to that Subject. The Reputation this Author has acquired by the different Works he has published, may well raise a Curiosity for any Thing done by his Hand.

Mr. *le Roman*, Chief Engineer of the Island of *Grenade*, gave us all the necessary Information relating to the *Sugar-Works*; and an Account of several other Works and Machines, which, in the Course of his Travels, he had Opportunities of observing and examining as a Philosopher.

Mr. *Venelle*,

Mr. *Venelle*, who is extremely well versed both in Natural Philosophy, and Chemistry, upon which he presented some excellent Memoirs to the Academy of Sciences; has communicated to us many useful and important Discoveries in *Mineralogy*.

Mr. *Goussier*, already mentioned on the Article of *Stone-cutting*, who, besides his great Skill in Mechanics, is an excellent Designer, gave Mr. *Diderot* the Draughts of several Instruments, and their Explanations. He has also bestowed particular Pains upon the Figures for our Encyclopædia; having himself drawn the most of them, and revised the rest: he gave us stringed Instruments in general, and that vast Machine the Organ, all the Parts whereof he has described from the Memoirs of Mr. *Thomas*, his Associate in that Work.

Mr. *Rogeanu*, an able Professor of Mathematics, furnished us with Materials upon the *Coinage*, and several Figures which were either drawn or revised by himself.

It may well be supposed that with regard to *Printing* and *Bookselling*, the associated Booksellers, concerned in this Work, have given us all the Assistance we could desire.

Mr. *Prevost*, Inspector of the Glass-works, gave the necessary Information in the important Art of Glass.

The Article of *Brewing* is drawn up from a Memoir of Mr. *Longchamp*, who could not be diverted from the Business of his Ancestors

by a considerable Fortune, and a great Capacity for Learning.

Mr. *Buiffon*, Manufacturer at *Lyons*, and formerly Inspector of the Manufactures, gave us his Memoirs upon *Dying*, *Clothiery*, and the making of rich Stuffs; the manufacturing of *Silk*, winding, quilling, throwing, milling, &c. together with Observations upon the Arts thereto relating, as the *Gilding of Silver*, *Gold-beating*, *Wire-drawing*, *Spinning*, &c.

Mr. *la Bassée* furnished the Articles of the *Lace-Trade*; the Particulars whereof are only understood by those employed in the Business.

Mr. *Douet* contributed his utmost to acquaint us with the Art of making *Gauze*, which is his Profession.

Mr. *Barrat*, an excellent Stocking-Weaver, several Times took to Pieces, and put together, his admirable Machine, in the Presence of Mr. *Diderot*; and gave the proper Information relating to his Trade.

Messieurs *Bonnet* and *Laurent*, Manufacturers in *Silk*, put up and worked, in the Presence of Mr. *Diderot*, their Loom for *Velvet*, &c. and one for *Brocade*. The Particulars appear under the Article *VELVET*.

Mr. *Papillion*, a famous Carver in Wood, delivered us a Memoir upon the History and Practice of his Art.

Mr. *Fournier*, an exceeding good Letter-Founder, gave us a Memoir upon the Casting of Types.

Mr. *Favre*

Mr. Favre gave us Memoirs upon *Iron-Works, Lock-Smithery, Foundery, Casting of Cannon, &c.* in which he is very well versed.

Mr. Mallot, Pewterer, at *Melun*, has given us a complete Account of his Art.

Mr. Hill, an *Englishman*, communicated to us an *English Glass-House, in Relievo*; with all the Instruments and necessary Explanations belonging thereto.

Messieurs *Puisieux, Charpentier, Mabile, and de Vienne*, assisted Mr. *Diderot* in the describing of several Arts. Mr. *Eidous* drew up all the Articles of *Farriery*, and the *Manage*; and Mr. *Arnauld* of *Senlis*, those of *Hunting and Fishing*.

To conclude, many public-spirited Persons gave Mr. *Diderot* Instructions in the Articles of *Slate-Work, Forging, Foundery, Recasting, Refining, &c.* but most of these Persons being absent, we were not at Liberty to publish their Names without their Consent; but are ready to do it upon the least Intimation of its being agreeable. The Names of others may have escaped our Memory. And as to those whose Communication we have made no use of, we thought it needless to mention them.

We publish this first Volume at the precise Time we promised. The second Volume is already in the Press; and we hope the Public will not be made to wait for the rest, nor the Volumes of Plates: nothing will prevent us from keeping our Word, but the Want of Life, Health, or Repose. We also advertise, in the Name of the associated Booksellers,
that

that in Case of a second Edition, the Additions and Corrections will be delivered, in a separate Volume, to the Purchasers of the first. Those who are pleased to give us any Assistance in carrying on the remaining Part of this Work, shall be mentioned at the Beginning of each Volume.

And thus much we had to say of this vast Collection; which appears with Circumstances that may well interest the Public in its Favour: *viz.* the Impatience with which it has been expected; the Difficulties that have retarded it; the Obligations we lay under of taking the Labour of Editors upon ourselves; the Zeal wherewith we have submitted to the Office, as if it had been our own Choice; the Applause which the Design has met with from good Subjects; the numerous Assistances of all Kinds which we have received; the Protection of the Government; powerful and feeble Enemies, who have in vain endeavoured to stifle the Work in its Birth; and Authors, who, without Cabal or Intrigue, look for no other Reward of their Industry, than the Satisfaction of serving their Country.

We desire not to compare this Dictionary with others; we acknowledge with Pleasure that they have all been useful to us: and would not discredit any one's Labour. We submit our Work to the Judgment of those who read; and distinguish such from Judges who only talk.

AN
ANALYTICAL
TABLE, or PLAN,
OF
HUMAN KNOWLEDGE.

PHYSICAL Objects act upon the Senses. The Impressions of these Objects excite Perceptions in the Mind. The Mind employs itself upon these Perceptions three different Ways, according to its three principal Faculties; *viz.* Memory, Reasoning, and Imagination. The Mind either takes a pure and simple Review of its Perceptions by Memory; or it examines, compares, and digests them by Reasoning; or else entertains itself with imitating, or resembling them, by Imagination. And hence arises a just, and general Distribution of human Knowledge, into (1) *History*, which relates to Memory; (2) *Philosophy*, which is the Produce of Reasoning; and (3) *Poetry*, which flows from the Imagination.

M E M O R Y;

From whence proceeds

H I S T O R Y.

HISTORY relates Facts, which either regard *God, Man, or Nature.* The Facts regarding

ing God, belong to *Sacred History*; the Facts regarding Man, belong to *Civil History*; and the Facts regarding Nature, belong to *Natural History*.

H I S T O R Y.

I. SACRED. II. CIVIL. III. NATURAL.

I. SACRED HISTORY is divided into *Religious*, or *Ecclesiastical*; and the *History of Prophecies*, where the Relation precedes the Event.

II. CIVIL HISTORY is a Branch of Universal History, to whose Trust are committed the Examples of Antiquity, the Revolutions of Things, the Foundations of Civil Prudence, the Names and Reputations of Men. This is divided, according to its Objects, into proper *Civil History*, and *Literary History*.

The Sciences are the Produce of Reflection, and the natural Light of Mankind. Chancellor Bacon had therefore Reason to say, in his admirable Work *de dignitate & augmentis Scientiarum*, that the History of the World, without the History of Learning, is like the Statue of *Polypbeme*, without its Eye. *Civil History*, proper, may be subdivided into *Memoirs*, *Antiquities*, and *Complete History*. As Civil History is the Representation of Times past, *Antiquities* are damaged Sketches thereof; and Complete History a Copy drawn from *Memoirs*.

III. The Distribution of NATURAL HISTORY arises from the Difference of the Facts of Nature, proceeding from her different States. For Nature is either uniform, and pursues a regular Course, as is generally the Case in the *heavenly Bodies*, *Animals*, *Vegetables*, &c. or she seems to be

be turned aside, or driven out of her ordinary Course, as in the Production of *Monsters*; or put under Constraint, and bent to various Uses, as in the *Arts*. So that Nature performs every Thing either in her ordinary regular Course, or in her Aberrations, or as she is applied. The Productions of *Uniform Nature* constitute the first Part; her Errors or *Aberrations* the second; and the *Uses to which she is applied* constitute the third Part of Natural History.

It is needless to enlarge upon the Advantages of the History of *Uniform Nature*: but the *History of her Aberrations* shews the Transition from monstrous Productions to the Wonders of Art; or how she may be put out of her Course, or brought back to it again; and particularly teaches us to correct the Depravity of too general Propositions.

The *History of Nature applied to different Uses* may be considered as a Branch of Civil History; for Art, in general, is the Industry of Man applied, either from Necessity, or Luxury, to the Productions of Nature. And this Application can only be made by bringing natural Bodies together, or taking them asunder: accordingly Man can here act no farther than as he is able to bring Natural Bodies together, or take them asunder.

The *History of Uniform Nature* is divided, according to its principal Objects, into (1) the *History of the Heavenly Bodies*, their *Motions*, *sensible Appearances*, &c. without accounting for their Causes by Systems, Hypotheses, &c. but considering them only as Phænomena. (2) The *History of Meteors*; as *Winds*, *Rains*, *Storms*, *Thunders*, *Aurora boreales*, &c. (3) The *History of the Land and Sea*; viz. *Mountains*, *Rivers*,
Currents,

Currents, Flux and Reflux, Sands, Lands, Forests, Islands, Continents, &c. (4) *The History of Minerals; the History of Vegetables; the History of Animals: whence arises* (5) *the History of the Elements; or the apparent Nature, sensible Effects, Motions, &c. of Fire, Air, Earth, and Water.*

The *History of monstrous Productions* is divisible in the same Manner. Nature may produce Prodigies in the Heavens, in the Air, on or below the Surface of the Earth, at the Bottom of the Sea, &c. either particularly or universally.

The *History of the Applications of Nature* is as extensive as the various Uses to which Mankind apply all the Natural Productions, in Arts, Trades, and Manufactures. Every Effect of human Industry may be referred to some Production of Nature. Under the Heads of Gold and Silver, come all the Arts of *Minting, Gold-Beating, Gold-Spinning, Wire-Drawing, Flatting, Gilding, &c.* under Precious Stones, come the Arts of the *Lapidary, Diamond-Cutter, Jeweller, Seal-Engraver, &c.* under Iron, come *Foundery, Forging, Smithery, Armoury, Gun-Smithery, Cutlery, &c.* under Glais, come the Art of *Glass, Plate-Glass, Looking-Glass, Window Glass, &c.* Under Skins, come the Arts of the *Tanner, Skinner, Furrier, &c.* Under Wool and Silk come the Arts of *Spinning, Milling, Throwing, Bed-Lace, Buttons, Velvet, Sattin, Damask, Brocades, Lustrings, &c.* Under Earth, come *Pottery, Delft-Ware, Porcelain, &c.* Under Stones, come the Mechanic Part of *Architecture, Sculpture, Stucco, &c.* Under Wood, come *Cabinet-Makers, Carpenters, Inlayers, Vaneerers, &c.* and so of all other Materials, and the rest of the Arts, being, in Number, upwards of two hundred and fifty. We have already shewn how we propose to treat of each in our Dictionary.

Such

Such is the *Historical Part* of human Knowledge, with regard to the *Memory*; and ought to be the *Materia prima* of Philosophers.

REASON, whence PHILOSOPHY.

PHILOSOPHY, or that Part of human Knowledge relative to Reason, is very extensive. There is scarce an Object perceived by the Senses, but Reflection has made a Science of it. In the Multiplicity of these Objects there are some, which, by their Importance, require particular Attention, in order to prevent endless Search; and to which all the Sciences may be referred. These principal Objects are (1) *God*; to the Knowledge of whom Man raises himself, by reflecting upon Natural and Sacred History: (2) *Man*, who is convinced of his own Existence by his Consciousness or internal Perception: (3) *Nature*, the History whereof we are taught by our external Senses. The grand Articles, therefore, of *God*, *Man*, and *Nature* will furnish us with a general Distribution of *Philosophy*, or *Science*, (which are reciprocal Terms) into *the Science of God*, *the Science of Man*, and *the Science of Nature*.

PHILOSOPHY, or SCIENCE.

- I. SCIENCE OF GOD. II. SCIENCE OF MAN.
III. SCIENCE OF NATURE.

I. The natural Progress of the Mind is to rise from Individuals to Species, from Species to Genuses,
from

from lower Genuses to higher, and at every Step to form a Science ; or at least to add a new Branch to a Science already formed. Thus our Idea of an infinite, uncreated Intelligence, found in Nature, and revealed in Sacred Writ ; and our Idea of a created, finite Intelligence united to a Body, as we find in Man, and suppose in Brutes, lead us to the Idea of a created, finite Intelligence without Body ; whence we derive our general Notion of Spirit. Now the general Properties of Things, both spiritual and corporeal, being *Existence, Possibility, Duration, Substance, Attribute, &c.* the Examination of these Properties produces *Ontology, or the Science of Beings in general.* And thus, by inverting the Order, we have first the *Science of Ontology*, and next the *Science of Spirit, or Pneumatology*, usually called *Particular Metaphysics* ; divided into the *Science of God, or Natural Theology*, which He has been pleased to rectify, and sanctify by *Revelation* ; whence proceeds *Religion, or Theology, proper* ; and, by its Abuse, *Superstition.* Hence follows the *Science of good and bad Spirits, or Angels and Devils* ; with its Derivatives, *Divination*, and supposed *Necromancy.* Hence also comes the *Science of the Soul* ; which is divided into the *Science of the rational thinking Soul* ; and the *Science of the sensitive Soul*, which is limited to Sensations.

II. THE SCIENCE OF MAN. The Distribution of this Science is derived from the Faculties of Man : the principal whereof are the *Understanding*, and the *Will.* The *Understanding* should be directed to *Truth* ; and the *Will* to *Virtue.* The first is the End of *Logic*, and the second of *Morality.* *Logic* may be divided into the *Art of Thinking*, the *Art of Retention*, and the *Art of Communication.*

The

The Art of Thinking has as many Parts as the Mind has principal Operations. We distinguish four principal Operations in the Mind; *viz.* *Apprehension*, *Judgment*, *Reasoning*, and *Method*. To *Apprehension* belongs the *Doctrine of Ideas*, or *Perceptions*: to *Judgment*, the *Doctrine of Propositions*: to *Reasoning* and *Method*, the *Doctrine of Induction* and *Demonstration*. But *Demonstration* either ascends from the Proposition to first Principles; or descends from first Principles to the Proposition in Proof: whence arise *Analysis* and *Synthesis*.

The *Art of Retention* has two Branches; *viz.* the Science of the *Memory itself*, and the Science of the *Helps to Memory*. The Memory, before considered as a Faculty purely passive, is now considered as an active Power, improved by Reason; and is either *natural* or *artificial*. *Natural Memory* depends upon the Organs. *Artificial Memory* consists in *Prænotion* and *Emblem*. Without *Prænotion* no particular Object can be present to the Mind; and *Emblem* employs the *Imagination* to assist the Memory.

Artificial Representations, as Writing, &c. are *Helps to Memory*. In Writing we use either *common*, or *particular Characters*; of the first Sort are the Letters of the *Alphabet*; and of the second are *Cyphers*; whence proceed the Arts of *Reading*, *Writing*, *Decyphering*, and the Science of *Orthography*.

The *Art of Communication* is divided into the Science of the *Instrument*, and the Science of the *Qualities, of Discourse*. The Science of the Instrument of Discourse is called *Grammar*; the Science of the Qualities of Discourse is *Rhetoric*.

Grammar is divided into the Science of *Signs*, *Pronunciation*, *Syntax*, and *Construction*. These

Signs are articulate Sounds; *Pronunciation*, or *Prosody*, is the Art of articulating them; *Syntax* is the Art of applying them, according to the different Designs of the Mind; and *Construction* is the Knowledge of the Order they should have in Discourse, founded upon Custom and Reflection. But there are other Signs of our Thoughts besides articulate Sounds; viz. *Characters* and *Gestures*. Characters are either *Ideal*, *Hieroglyphic*, or *Heraldic*. *Ideal* Characters are like those of the *Indians*, each of which denotes a particular Idea; and must consequently be as numerous as the real Beings they denote. *Hieroglyphics* were the Writing of the World in its Infancy: and *Heraldic* Characters form the Science of *Blazoning*.

To this Art of *Communication* belong *Criticism*, *Pædago*gy, and *Philology*. *Criticism* restores corrupt Readings, publishes Authors, &c. *Pædago*gy treats of the Choice of Studies, and the Manner of Teaching. *Philology* regards the Knowledge of universal Literature.

To the Art of *embellishing Discourse* belongs *Versification*, or the *mechanical Part of Poetry*. We omit the Division of *Rhetoric*, because no Art or Science is derived from it, except perhaps the *Pantomimic* Art, from *Gesture*; and *Declamation*, from the Voice and *Gesture* together.

MORALITY, which makes the second Part of the *Science of Man*, is either *general*, or *particular*. Particular Morality is divided into the *Law of Nature*, *Æconomics*, and *Politics*.

The *Law of Nature* is the Science of the Duties of Man, out of Society. *Æconomics* is the Science of Man's Duties in a Family. *Politics* is the Science of Man's Duties in Society. But *Morality*

lity would be incomplete unless preceded by the Doctrine of the *Reality of moral Good and Evil*; the Necessity of discharging the Duties of a *good, just, and virtuous Man*, &c. which is the Object of *Morality*, in general.

As Societies are under the same Obligation of being virtuous, as particular Persons; this leads to the Duties of Societies, or the natural Law of Society; the *Economics* of Societies; *foreign and domestic Commerce, by Sea and Land*; and the Doctrine of *Civil Policy* relative to each Society.

III. THE SCIENCE OF NATURE is divided into *Natural Philosophy*, and *Mathematics*. This Division naturally arises from Reflection, and Man's Disposition to form general Ideas. From our Senses we receive the Knowledge of real Individuals, the Sun, the Moon, *Sirius*, &c. Air, Fire, Earth, Water, &c. Rain, Snow, Hail, Thunder, &c. and so of all Natural History. At the same Time we acquire the Knowledge of abstract Ideas; as *Colour, Sound, Taste, Odour, Density, Rarity, Heat, Cold, Soft, Hard, Fluidity, Solidity, Rigidity, Elasticity, Gravity, Levity, &c. Figure, Distance, Motion, Rest, Duration, Extension, Quantity, Impenetrability*.

We find by Reflection, that some of these abstract Ideas, as *Extension, Motion, Impenetrability, &c.* correspond to all corporeal Individuals, which are the Object of *General Physics*, or the *Metaphysics* of Bodies; and the same Properties, considered in any particular Individual, together with the Varieties that distinguish one Individual from another, such as *Firmness, Elasticity, Fluidity, &c.* are the Object of *Particular Physics*. Another more general Property of Body, which supposes all the rest, viz. *Quantity*, constitutes the

Object of *Mathematics*. By *Quantity*, or *Magnitude*, we mean every Thing capable of Augmentation or Diminution.

Quantity, as the Object of *Mathematics*, may be considered, (1) either alone, and independent both of the real and abstract Individuals we know; or, (2) as existing in real and abstract Individuals; or, (3) in Effects sought for from real or supposed Causes: and in this View, Reflection divides *Mathematics* into *pure*, *mixt*, and *physical*.

Abstract Quantity, the Object of pure *Mathematics*, is measured by *Number*, or *Extension*. *Abstract Quantity* measured by *Number*, is the Object of *Arithmetic*; and *Abstract Quantity*, as extended, is the Object of *Geometry*. *Arithmetic* is divided into *Numeral*, performed by *Figures*; and *Algebra*, or *Universal Arithmetic*, performed by *Letters*; which is only the Calculation of *Magnitudes* in general; its Operations being no more than *Arithmetical Operations*, performed in a concise Manner: for, properly speaking, there is no Calculation but in Numbers.

Algebra is either *Elementary*, or *Infiniteesimal*, according to the Nature of the Quantities to which it is applied. *Infiniteesimal Algebra* is either *Differential*, or *Integral*: *Differential*, when we descend from the Expression of a finite Quantity, or of a Quantity considered as finite, to its instantaneous Increment or Decrement; and *Integral*, when we ascend from this Expression, to that of the finite Quantity.

Geometry has for its primitive Object, either the Properties of right Lines, and the Circle; or comprehends all the Species of Curves: and therefore is divided into *Elementary*, and *Transcendental*.

Mixt

Mixt Mathematics has as many Divisions and Subdivisions as there are real Beings, wherein *Quantity* may be considered. *Quantity* considered in Bodies as moveable, or tending to Motion, is the Object of *Mechanics*.

Mechanics has two Branches; *Statics* and *Dynamics*. The Object of *Statics* is *Quantity* considered in Bodies that are in *equilibrio*, and have only a Tendency to Motion; and the Object of *Dynamics* is *Quantity* considered in Bodies actually moving. *Statics* and *Dynamics* have each two Parts. *Statics* is divided into *Statics proper*, and *Hydrostatics*. *Statics* has for its Object solid Bodies in *equilibrio*, barely tending to Motion. The Object of *Hydrostatics* is *Quantity* considered in equipollent Fluids tending to Motion. *Dynamics* is divided into *Dynamics proper*, which has for its Object *Quantity* considered in solid Bodies, actually moved; and *Hydrodynamics*, whose Object is *Quantity* considered in Fluids actually moved. When *Quantity* is considered in Water actually moved, *Hydrodynamics* takes the Name of *Hydraulics*. *Navigation* might be referred to *Hydrodynamics*; and *Ballistics*, or the Throwing of Bombs, to *Mechanics*.

Quantity considered in the Motion of the heavenly Bodies produces *Geometrical Astronomy*; whence arises *Cosmography*, or the Description of the Universe; which is divided into *Uranography*, or the Description of the Heavens; *Hydrography*, or the Description of Waters; and *Geography*: from whence also proceed *Chronology*, and *Gnomonics*, or the Art of constructing Sun-Dials.

Quantity considered in Light, produces *Optics*; and considered in the Motion of Light, it produces the different Branches of *Optics*. Light moving

in strait Lines, gives *Optics, proper*; Light reflected, in one and the same Medium, gives *Catoptrics*; and as refracted in passing from one Medium into another, it affords *Dioptrics*. Perspective belongs to *Optics*.

Quantity considered in Sound, as to Violence, Motion, Degrees, Reflections, Velocity, &c. produces *Acoustics*.

Quantity considered in the Air, as to its Gravity, Motion, Condensation, Rarefaction, &c. produces *Pneumatics*.

Quantity considered in the Possibility of Events, gives the *Art of conjecturing*; whence the *Analysis of the Games of Chance*.

The Object of the Mathematical Sciences being purely intellectual, we need not be surprised at the Exactness of their Division.

Particular Physics should have the same Distribution as Natural History. From Histories, acquired by the Senses, of the Stars, their Motion, sensible Appearances, &c. Reflection proceeds to enquire into their Origin, the Causes of their Phenomena, &c. and thus produces the Science of *Physical Astronomy*; under which we also rank the Science of their Influences, called *Astrology*; whence *Physical Astrology*, and the Fiction of *Judiciary Astrology*. From Histories, given by the Senses, of Winds, Rain, Hail, Thunder, &c. Reflection proceeds to enquire into their Origin, Causes, Effects, &c. and produces the Science of *Meteorology*.

From Natural Histories of the Earth, the Sea, Mountains, Rivers, Flux, Reflux, &c. Reflection enquires into their Origins, Causes, &c. and produces *Cosmology*, or the Science of the Universe; which is divided into *Uranology*, or the Science of the

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the Heavens; Aërology, or the Science of the Air; Geology, or the Science of Continents; and Hydrology, or the Science of Waters.

From the Natural History of *Mines*, Reason enquires into their Formation, the Ways of working them, &c. and thus proceeds *Minerology*.

From the Natural History of *Plants*, Reason enquires into their Structure, Propagation, Culture, Vegetation, &c. and thus produces *Botany*; of which *Agriculture* and *Gardening* are Branches.

From the Natural History of *Animals*, Reason enquires into the Means of their Conservation, and Propagation, their Organization, Use, &c. and thus produces *Zoology*: whence are derived *Physic*, *Farriery*, the *Manage*, *Hunting*, *Fishing*, *Falconry*, *simple* and *comparative Anatomy*. *Physic*, according to *Boerhaave's* Division, is either employed (1) upon the *Œconomy* of the human Body, and reasoning upon the *Anatomy* thereof; whence proceeds *Physiology*; or, (2) upon the Means of preventing Diseases; whence *Hygieine*; or, (3) upon morbid Bodies, and treats of the Causes, Differences and Symptoms of Diseases, their Nature and Effects, under the Name of *Semeiotics*; or, (4) upon the Art of Curing, subdivided into *Diet*, *Pharmacy*, and *Chirurgery*; which are the three Branches of *Therapeutics*.

Hygieine may be considered as relative to the *Health*, *Beauty*, and *Strength* of the Body; and accordingly is subdivided into *Hygieine proper*, *Cosmetics*, and *Athletics*. *Cosmetics* produces *Orthopæia*, or the Art of procuring a just Conformation of the Limbs; and *Athletics* produces *Gymnastics*, or the Arts of Exercise.

From an experimental History of the *external*, *sensible*, and *apparent Qualities*, &c. of natural Bodies,

Bodies, Reflection rises to an artificial Examination of their internal latent Properties, by Means of *Chemistry*; which is an Art that imitates and rivals Nature: its Object being nearly as extensive as Nature itself. This Art either *analyses* Bodies, *recompounds* them, or *transforms* them. Chemistry gives Rise to *Alchemy*, and *Natural Magic*. *Metallurgy*, or the *Art of working Metals for human Uses*, is an important Branch of *Chemistry*. The Art of *Dying* is also a Branch of Chemistry.

Nature has her Aberrations, and Reason its Abuses. We consider *Monsters* as Aberrations of Nature; and the Abuse of Reason produces those Arts and Sciences, which only manifest Avidity, Malice, or Superstition; and tend to disgrace Mankind.

And this is the grand *Philosophical Branch* of human Knowledge, belonging to Reason.

IMAGINATION;

Whence proceeds

P O E T R Y.

HISTORY has for its Object such Individuals as actually exist, or have existed; and Poetry only imaginary Individuals, in Imitation of the historical. No Wonder therefore if Poetry falls under one of the Divisions of History, But the different Kinds of Poetry, and the Difference of its Subjects, present us two very natural Distributions. The Subject of a Poem is either *sacred* or *prophane*. The Poet therefore relates

relates Things past; or makes them appear as present, by representing them in Action; or else gives Bodies to mere abstract, intellectual Beings. The first Kind is *Narrative*, the second *Dramatic*, and the third *Parabolic Poetry*. *Epic Poem*, *Madrigal*, *Epigram*, &c. are generally of the *Narrative*; *Tragedy*, *Comedy*, *Opera*, *Eclogue*, &c. of the *Dramatic*; and *Allegory*, &c. of the *Parabolic Kind*.

P O E T R Y.

I. NARRATIVE. II. DRAMATIC.

III. PARABOLIC.

By *Poetry* we here understand Fiction only. As there may be Versification without Poetry, and Poetry without Versification; we consider *Versification* as a Quality of Style, and refer it to Rhetoric. On the other Hand, under Poetry we rank *Architecture*, *Music*, *Painting*, *Sculpture*, *Engraving*, &c. for a Painter may as justly be called a Poet, as a Poet be called a Painter. A Sculptor, or Engraver, is a Painter in *Relievo*, or in *Creux*; as a Musician is a Painter in Sounds. The *Poet*, the *Painter*, the *Sculptor*, the *Musician*, &c. imitate or counterfeit Nature; but the Poet employs *Discourse*, the Painter *Colours*, the Sculptor *Marble*, *Brass*, &c. and the Musician his *Instrument*, or his *Voice*. *Music* is either *Theoretical*, *Practical*, *Instrumental*, or *Vocal*. *Architecture* imitates Nature but imperfectly, in the Symmetry of its Productions. See above, under the Article *Architecture*.

Poetry

Poetry, as well as Nature, has its monstrous Productions, proceeding from a disordered Imagination: and such Productions may happen in all the Species of Poetry.

This is the whole *Poetical Branch* of human Knowledge, belonging to the Imagination; and the End of our genealogical Table, or Map, of the Arts and Sciences. We should fear we had been too particular, were it not of the utmost Consequence for us to be Masters of the Object of an Encyclopædia, and capable of explaining it to others.

OBSER-

OBSERVATIONS

ON Lord Chancellor Bacon's DIVISION of the SCIENCES.

I. **W**E have often acknowledged that we were principally indebted to Chancellor *Bacon* for the Plan of our Encyclopædia. The just Character given of this great Man in our *Proposals*, has contributed to make his Works more generally known and sought for. After such a frank Acknowledgement, no Man has a Right to reproach us as Plagiaries.

II. Notwithstanding this Acknowledgment, there are numerous Particulars, especially in the Philosophical Branch, for which we are no Way indebted to *Bacon*; as the Reader may easily perceive. To shew the Agreement and Difference of the two Plans, it is necessary to observe where the same Articles and Dispositions do or do not occur in both. All Encyclopædiac Plans must needs resemble one another in the Materials; and can only be distinguished by the Order and Dispositions observed.

observed. Nearly the same Names of Sciences occur in *Chambers's* Plan and ours; yet the two are extremely different.

III. It is not material here to assign the Reasons of our observing a different Order from that of *Bacon*. We have already mentioned some of them; and it would be tedious to give a particular Account of the rest; especially as there must always be something arbitrary in ranging the Sciences. It belongs to Philosophers, who are a very small Number, to judge of our Conduct.

IV. Some Divisions, as of Mathematics into pure and mixt, which we have in common with *Bacon*, are so universal as to be no Man's Property. Our Division of Physic is taken from *Boerhaave*; as was mentioned in our *Proposals*.

V. We have made some Alterations in our original Plan, which stands in our *Proposals*; so that those who compare that Plan with *Bacon's*, should consider the Alterations we have since made in it.

VI. Upon these Principles it is that the two Plans should be compared, without departing from Equity and Philosophy.

THE
General SYSTEM
OF
HUMAN KNOWLEDGE,
According to
Lord Chancellor B A C O N.

THE general Division of human Knowledge into (1) *History*, (2) *Poetry*, and (3) *Philosophy*; according to the three Faculties of the Mind, *Memory*, *Imagination*, and *Reason*.

Bacon observes that this Division is also applicable to Theology. We adopted this Thought in our Proposals; but have since rejected it, upon finding it more ingenious than solid.

I.

The Division of *History* into *Natural* and *Civil*. *Natural History* divided into (1) the *History of the Productions of Nature*, (2) the *History of the Aberrations of Nature*, and (3) the *History of the Applications of Nature*, or *History of Arts*.

The second Division of *Natural History*, derived from its *End* and *Use*, into *History proper*; and *rational History*.

Division of the *Productions of Nature*, into (1) the *History of the Heavenly Bodies*; (2) of *Meteors*; (3) of the *Air*, (4) the *Earth*, (5) the *Sea*, (6) of the *Elements*, (7) of *particular Species*, and (8) *Individuals*.

Division

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Division of Civil History into (1) *Ecclesiastical*, (2) *Literary*, and (3) *Civil History*, proper.

The first Division of Civil History, proper, into (1) *Memoirs*, (2) *Antiquities*, and (3) *Complete History*.

The Division of Complete History, into *Chronicles*, *Lives*, and *Relations*.

The Division of the History of Times, into *General* and *Particular*.

A second Division of the History of Times, into *Annals* and *Journals*.

A second Division of Civil History, into *Pure* and *Mixed*.

Division of Ecclesiastical History, into particular *Ecclesiastical History*, and the *History of Prophecies*, which contains Predictions and their Accomplishments; as also the History of what Bacon calls *Nemesis*, or *Providence*, that is, the Agreement sometimes observed between the revealed and the secret Will of God.

Division of that Part of History regarding Remarkable Sayings, into *Letters* and *Apophthegms*.

II.

The Division of Poetry, into *Narrative*, *Dramatic*, and *Parabolical*.

III.

General Division of Science, into *Sacred Theology*, and *Philosophy*.

Division of Philosophy, into the *Science of God*, the *Science of Nature*, and the *Science of Man*.

Primary Philosophy, or the *Science of Axioms*, which extends to all the Branches of Philosophy. A second Branch of this Primary Philosophy treats of

of the *Transcendental Qualities* of Beings, as *Little, Much, Like, Different, Entity, Nonentity, &c.*

The Science of Angels and Spirits; a Consequence of *Natural Theology*, or the Science concerning God.

Division of the Science of Nature, or Natural Philosophy, into *Speculative* and *Practical*.

Division of the Speculative Science of Nature into *Particular Physics*, and *Metaphysics*: *Physics* having for its Object the efficient Cause and the Matter; and *Metaphysics*, the final Cause and the Form.

The Division of Natural Philosophy, into *the Science of the Principles of Things*; *the Science of the Formation of Things*, or, *the World*; and *the Science of the Variety of Things*.

Division of the Science of the Variety of Things, into *the Science of Concretes*, and *the Science of Abstracts*.

Division of the Science of Concretes, into the same Branches as Natural History.

Division of the Science of Abstracts, into the *Science of the particular Properties of different Bodies*, as *Density, Levity, Gravity, Elasticity, Softness, &c.* and the *Science of Motions*, whereof Chancellor Bacon gives a long Catalogue conformable to the Notions of the Schoolmen.

Branches of Speculative Philosophy, consisting of *Natural Problems*, and *the Sentiments of the ancient Philosophers*.

Division of Metaphysics, into the *Science of Forms*, and the *Science of final Causes*.

Division of the Practical Science of Nature, into *Mechanics* and *Natural Magic*.

Branches of the Science of Nature, consisting in an *Enumeration of the human Treasures, both natural and artificial, past and present*; and the Catalogue

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Catalogue of *Polychresta*, or Leading Experiments.

A considerable Branch of Natural Philosophy, both speculative and practical, called *Mathematics*. Its Division into *pure* and *mixt*. The Division of Pure Mathematics, into *Geometry* and *Arithmetic*. The Division of Mixt Mathematics, into *Perspective*, *Music*, *Astronomy*, *Cosmography*, *Architecture*, *the Science of Machines*, &c.

Division of the Science of Man, into *the Science of Man*, proper, and *the Science of Civil Life*.

Division of the Science of Man, into *the Science of the human Body*, and *the Science of the human Soul*.

Division of the Science of the human Body, into *Physic*, *Cosmetics*, *Athletics*, and the Science of the Pleasures of the Senses. Division of *Physic* into three Parts, the *Art of preserving Health*, the *Art of curing Diseases*, and the *Art of prolonging Life*. *Painting*, *Music*, &c. are Branches of the Science of Pleasures.

Division of the Science of the Soul, into *the Science of the Divine Infusion*, whence the *rational Soul*; and *the Science of the irrational Soul*, which Men have in common with Brutes, and was produced out of the Dust of the Earth.

A second Division of the Science of the Soul, into *the Science of the Substance of the Soul*; *the Science of its Faculties*; and *the Science of the Use and Object of those Faculties*: from which last results *natural and artificial Divination*, &c.

Division of the Faculties of the sensible Soul, into *Motion* and *Sensation*.

Division of the Science of the Use and Object of the Faculties of the Soul, into *Logic* and *Morality*.

Division

Division of Logic, into the *Art of inventing, judging, retaining, and communicating.*

Division of the Art of Inventing, into the *Invention of Sciences, or Arts, and the Invention of Arguments.*

Division of the Art of Judging, into *Judgment by Induction, and Judgment by Syllogism.*

Division of the Art of Syllogism into *Analysis, and Principles of distinguishing, with Facility, Truth from Falshood.*

The *Science of Analogy*, a Branch of the Art of Judging.

Division of the Art of Retaining, into the *Science of Helps to Memory, and the Science of Memory itself.*

Division of the Science of Memory, into *Prenotion and Emblem.*

Division of the Science of Communicating, into the *Science of the Instruments of Discourse, Science of the Method of Discourse, and Science of the Ornaments of Discourse, or Rhetoric.*

Division of the Science of the Instrument of Discourse, into the *general Science of Signs, and into Grammar, which is divided into the Science of Language, and the Science of Writing.*

Division of the Science of Signs, into *Hieroglyphics, Gestures, and real Characters.*

Second Division of Grammar, into *Literary and Philosophical.*

The Art of Versification, and Prosody, are Branches of the Science of Language.

The Art of Decyphering, is a Branch of the Art of Writing.

Criticism and Pædagogy are Branches of the Art of Communicating.

Division of Morality into *the Science of the Object*, which the Soul should propose to itself, viz. moral Good; and *the Science of the Improvement of the Soul*. Upon this Head the Author makes many Divisions, which need not be mentioned.

Division of the Science of Civil Life, into *the Science of Conversation*, *the Science of Affairs*, and *the Science of Politics*. The Divisions whereof we omit.

The Author concludes with Reflections on the Use of *Sacred Theology*, without dividing it.

This is Chancellor *Bacon's* Plan, neither dismembered nor mangled, but given in its natural Order. The Article *Logic* is that wherein we have followed him the closest; yet even here we thought proper to make several Alterations. We again repeat, that it is only the Province of Philosophers to judge of the Alterations we have made. Other Readers, doubtless, will be little concerned in this Point, though it was necessary for us to explain it. They will please to remember the express Acknowledgement made in our *Proposals*, that we were *principally* obliged to Lord Chancellor *Bacon* for our Plan: an Acknowledgement which ought to procure us the Favour of all impartial and disinterested Judges*.

* As the *French* Editors have so amply expressed their high Regard for Lord Chancellor *Bacon's* Philosophical Works; and nobly given him the Praise he justly

justly deserves, for planning out all the Arts and Sciences, and setting them forward in the Way of Improvement ; this perhaps may raise a Desire in the *English* Reader to consult those admirable Works ; which certainly have hitherto been too much neglected in *England*. Whoever desires to see the Plans and Views of this great Author, may find them in the *English* Edition of his Works, in three Quarto Volumes ; particularly in Vol. I. p. lxxii — lxxix. p. 267 — 270. and Vol. III. p. 19 — 31. where they appear to much greater Advantage, than here represented.



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